Macintosh® Communications Toolbox Reference

Version 1.0

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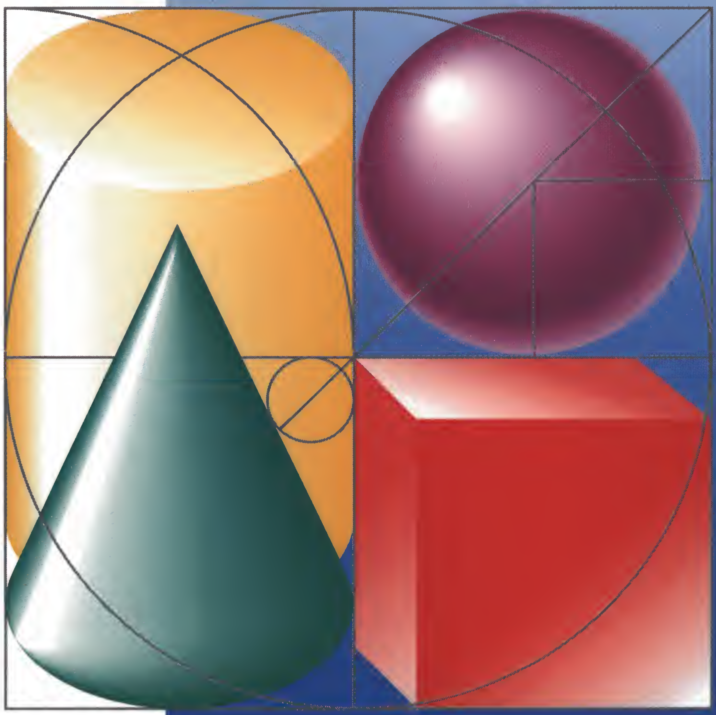

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Macintosh® Communications Toolbox Reference

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Preface

The Macintosh Communications Toolbox Reference provides definitive information for application software developers, communications tools developers, and hardware developers who want to use services provided by the Macintosh® Communications Toolbox. For application software developers, this document describes and shows how to use the four Communications Toolbox managers and utilities that make it easier to write communications software for the Apple® Macintosh computer. For communications tools developers, this document shows how to develop communications tools that can be used by the Communications Toolbox managers. And for hardware developers, this document shows what protocols to follow to register hardware—like internal modems or serial cards—with the Communications Toolbox Communications Resource Manager.

About this document

Chapter 1 contains an overview of the Communications Toolbox. Chapter 2 presents a sample application that uses the Communications Toolbox. The next five chapters discuss the Communications Toolbox managers and utilities, describing the routines and data structures that an application uses. Each of these chapters contains a table that lists the routines in that chapter in the order in which they are described. Chapters 3 to 11 conclude with "Quick References" that summarize the contents of the chapter. Chapters 8 through 11 show how to create a tool to add to the Communications Toolbox. While tool developers will be interested in reading these chapters, application developers may have little need to read them. Appendix A contains guidelines that communications tool developers should read to ensure that the tools they create are fully compatible with the Communications Toolbox. Appendix B provides sample code solutions to common programming problems.

The Macintosh Communications Toolbox Reference is written for experienced programmers. Readers should know how to program the Macintosh and have some familiarity with communications or networking applications. To use each manager requires specific programming knowledge; suggestions on where to find more information are included at the beginning of each chapter. In addition, the next section lists resources for reference information about the technical concepts used in this document.

For more information

Refer to the following books in the Apple Technical Library and Apple Communications Library, published by Addison-Wesley, for additional information about the subjects covered in this manual:

- *Designing Cards and Drivers for the Macintosh Family*
- *Human Interface Guidelines: The Apple Desktop Interface*
- *Inside Macintosh* (Volumes I-V, X–Ref)
- *Programmer's Introduction to the Macintosh Family*
- *Technical Introduction to the Macintosh Family*
- *AppleTalk Network System Overview*
- *Inside AppleTalk*

You may also refer to the following documents from APDA™:

- *Software Development for International Markets: A Technical Reference*
- *Macintosh Technical Notes*

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Conventions used in this document

The following notations are used in this document to draw attention to particular items of information:

◆ *Note:* a note that may be interesting or useful

◆ *Assembly note:* a note of interest to assembly-language programmers only

△ **Important** a note that is particularly important

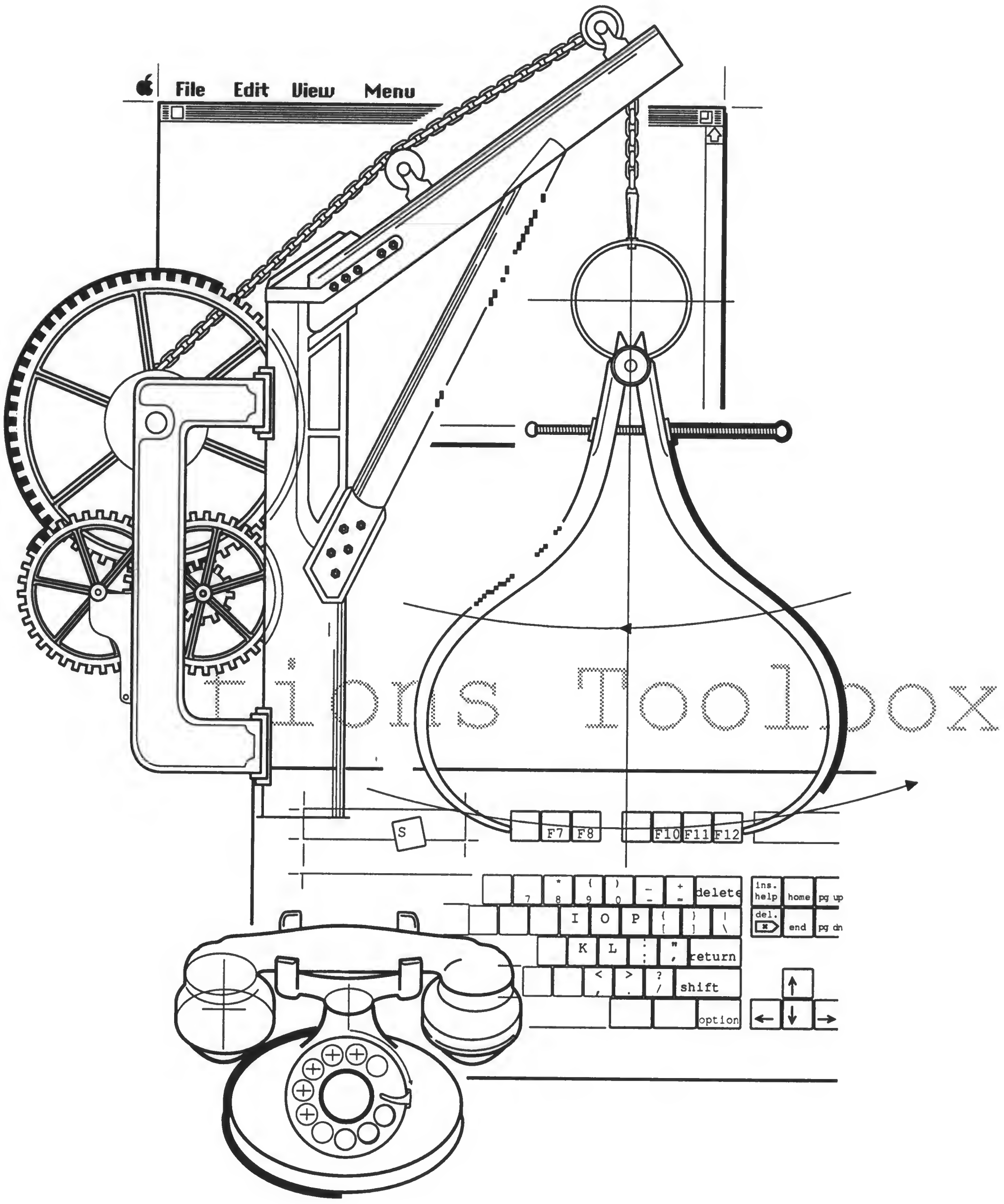
▲ **Warning** a point that you need to be cautious about

Words that appear in the glossary are presented in **bold** typeface when first introduced in the text.

Names of routines (procedures or functions), constants, and code fragments appear in a special typeface, as in the following example:

```
PROCEDURE GetDown(andBoogie : ONEMORETIME);
```

Chapter 1 **About the Macintosh Communications Toolbox**



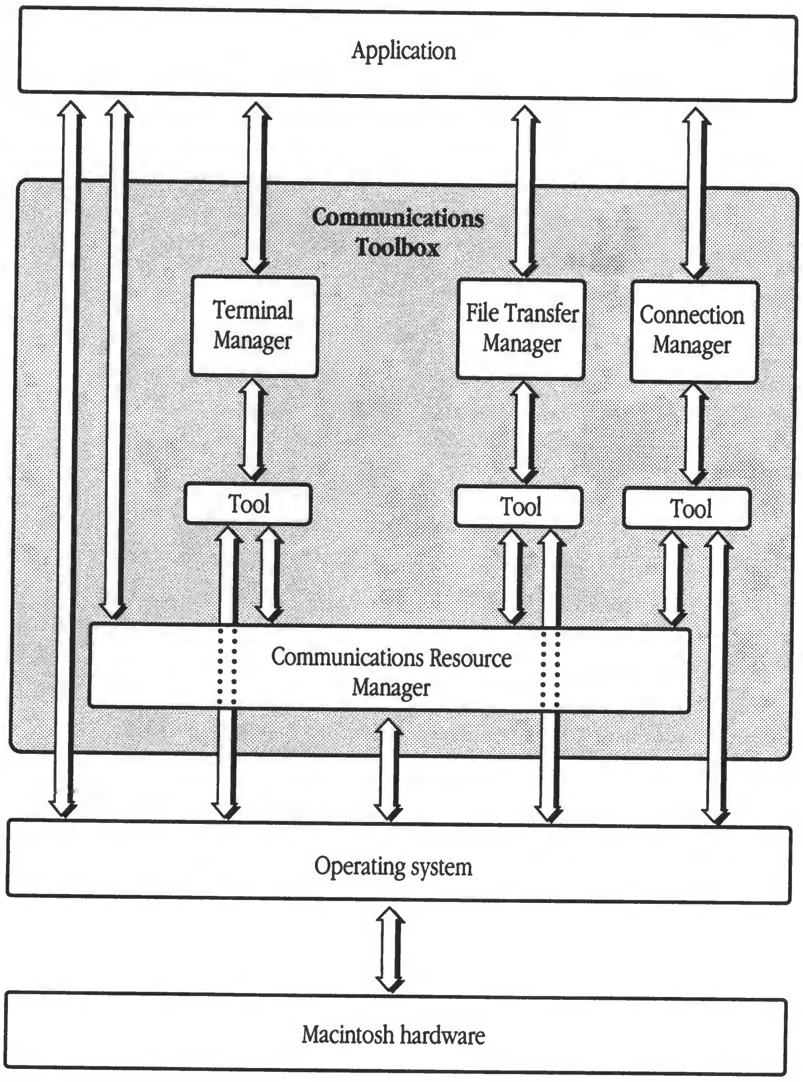
THIS CHAPTER gives you an overview of the Macintosh® Communications Toolbox. It tells you about the managers and utilities that are part of the Communications Toolbox, and then discusses a fundamental concept, the difference between **routines** and tools. The last part of the chapter provides system hardware and software requirements, and shows how to install Communications Toolbox tools.

Communications Toolbox contents

The Communications Toolbox consists of four managers and a set of utilities. These managers and utilities are an extension to the **Macintosh Toolbox** and provide basic networking and communications services. Just as the Macintosh Toolbox makes it easier for you to develop stand-alone Macintosh applications, the Communications Toolbox helps you add networking and communications functions to applications.

Each of the managers in the Communications Toolbox handles a different aspect of networking and communications: **connection** management, **terminal emulation** management, file transfer management, and communications resource management. The managers provide routines that your application can call to indirectly interact with the operating system. *Figure 1-1* shows how the Communications Toolbox fits between your application and the operating system.

■ **Figure 1-1** Where the Macintosh Communications Toolbox fits in



Although the managers in the Communications Toolbox handle distinctly different aspects of networking and communications, your application might need to call routines from more than one of the managers to implement a feature. For instance, in order to perform terminal emulation, in writing your program you might make use of **Connection Manager** routines to maintain the data connection, and **Terminal Manager** routines to handle the specifics of the terminal emulation.

However, your application does not have to use Communications Toolbox routines to perform all of its networking and communications tasks; for example, your application can maintain the data connection itself and use only the Terminal Manager to perform a terminal emulation. Keep in mind, though, that using Communications Toolbox routines ensures greater compatibility for your application with new tools as they become available.

Routines and tools: what's the difference?

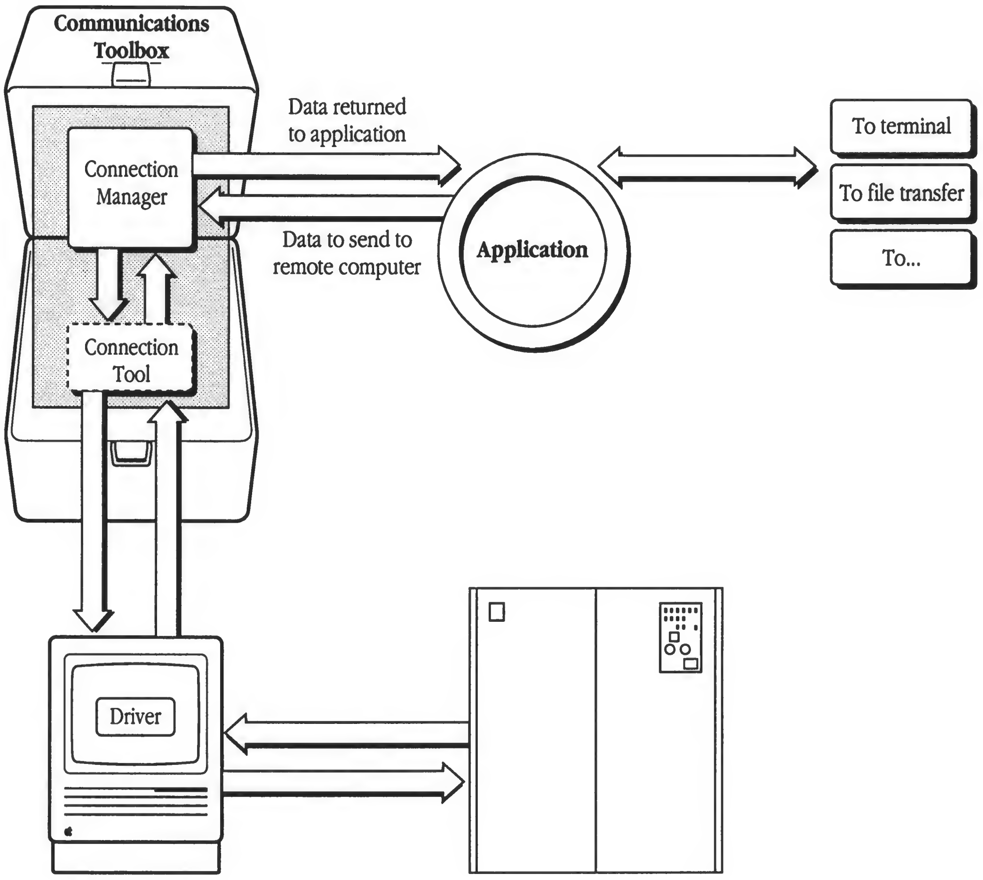
There are two interfaces (besides the user interface) to consider when programming with the Communications Toolbox: the interface between the application and the Communications Toolbox, and the one between the Communications Toolbox and the Macintosh Operating System.

The interface between an application and the Communications Toolbox is defined by the routines in each of the managers. By calling routines, an application can request basic networking and communications services. If you are writing applications (not tools), this is the interface with which you need to be most concerned; it is discussed in Chapters 3 through 7.

The interface between the Communications Toolbox and the Macintosh Operating System is controlled by tools. Tools are units of code that implement the networking and communications services that your application requests. When an application calls a Communications Toolbox routine, it does so without concern for the underlying protocols. It is the job of the tool to implement basic networking and communications services according to a specific protocol. If you are writing tools (not applications), this is the interface with which you need to be most concerned; it is discussed in Chapters 8 through 11. Tools writers need to read at least two of these chapters: Chapter 8, which discusses concepts common to all types of tools, and one of the other chapters that deals with a specific type of tool.

Figure 1-2 shows the interaction between an application and one of the Communications Toolbox managers, in this case the Connection Manager. Notice that the application interacts with the Connection Manager, which in turn interacts with the **connection tool.** The connection tool, in turn, communicates with a driver and passes back to the application (through the manager) any relevant information. (Chapter 3 contains a complete discussion of the Connection Manager.)

■ **Figure 1-2** How Macintosh Communications Toolbox managers interact with applications and tools



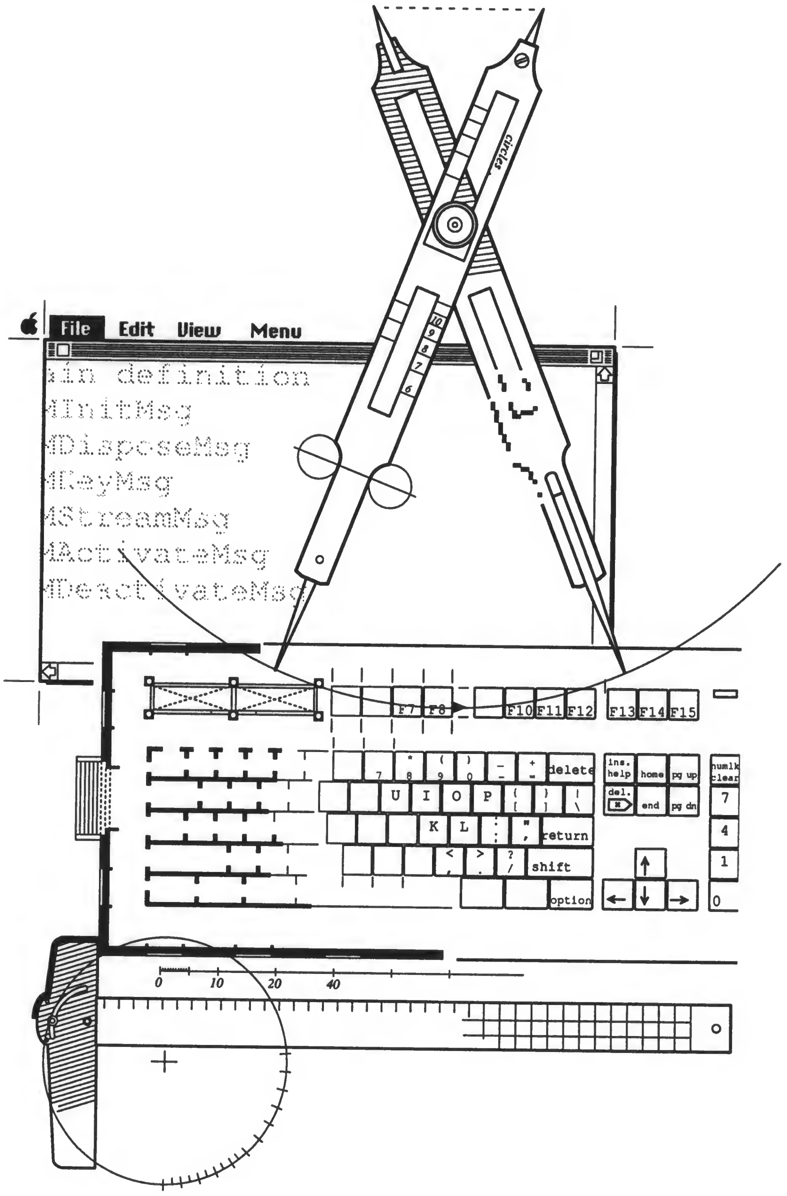
System requirements and installation

The Communications Toolbox can be run on all Macintosh computers that have at least 1 megabyte of random-access memory, Macintosh Plus (128K) ROM or later, and system software 6.0.4 or a later version. Minimum disk-space requirements are two floppy disk drives, a single Apple® SuperDrive™, or a hard disk (which is recommended).

◆ *Note:* On a 1-megabyte Macintosh running MultiFinder™, you may be able to run only a single application with the Finder™ coresident. You may also be unable to run HyperCard® under MultiFinder on a 1-megabyte Macintosh with the Communications Toolbox installed.

You can install additional tools into the Communications Toolbox by dragging the icon for each tool into the folder named *Communications Folder,* which is inside the System Folder. Your application can access tools immediately after you have installed them (you don't have to restart).

Chapter 2 **Programming with the Macintosh Communications Toolbox**



THIS CHAPTER provides an example of how applications can use the Communications Toolbox to implement communications services. The example focuses on use of the Communications Toolbox, rather than on Macintosh programming in general.

Thus, the sample code is not a complete program. It contains the parts of a program that handle communications functions; the rest of the program has been replaced with comments. This sample shows you where in an application to put the hooks to which you can attach Communications Toolbox routines.

The sample application, if it were a real, working program, would allow you to perform functions that span the three major Communications Toolbox managers: the Connection Manager, the Terminal Manager, and the **File Transfer Manager.** Specifically, the sample source code shows you how to

- open and close a connection
- send and receive files
- configure connections, terminal emulations, and file transfers
- clear the screen
- reset the terminal

The sample code is split into three sections to make it easier to understand. The first section shows how your application can deal with events that result from menu selections; the sample application contains routines that handle basic communications services, like opening a connection and sending a file. The second section shows how your application can deal with events like scrolling and mouse clicks. The last section shows the sample application's main code loop. You might find it helpful to read some of the chapters that discuss the managers before reading through the code.

Assume the following globals

```
VAR

      gTerm        : TermHandle;       { tool records }
      gFT          : FTHandle;
      gConn        : ConnHandle;
      gBuffer      : Ptr;              { My data buffer }
      gCache       : Handle;           { 1-line cache }

      done         : BOOLEAN;          { Main Event Loop Flag }
      gStartFT     : BOOLEAN;          { Flag to start a transfer }
      gWasFT       : BOOLEAN;          { Flag set during a transfer }
```

Menu events

Handling menu choices

```
PROCEDURE DoCommand(mResult : LONGINT);
VAR
       theItem       : INTEGER;                    { menu info }
       theMenu       : INTEGER;

BEGIN
       theItem := LoWord(mResult);                 { which item }
       theMenu := HiWord(mResult);                 { which menu }

       { First see if the menu belonged to a tool      }
       { If the tool handles it, then leave            }

       IF gTerm <> NIL THEN
              IF TMMenu(gTerm, theMenu, theItem) THEN BEGIN
                     HiliteMenu(0);
                     Exit(DoCommand);              { Terminal tool handled it }
              END;

       IF gConn <> NIL THEN
              IF CMMenu(gConn, theMenu, theItem) THEN BEGIN
                     HiliteMenu(0);
                     Exit(DoCommand);              { Connection tool handled it }
              END;

       IF gFT <> NIL THEN
              IF FTMenu(gFT, theMenu, theItem) THEN BEGIN
                     HiliteMenu(0);
                     Exit(DoCommand);              { FileTransfer tool handled it }
              END;

       { Must be an application menu }

       (*
       Application menu handling goes here
       *)

       HiliteMenu(0);
END; { DoCommand    }
```

Initiating a connection

```
PROCEDURE DoInitiate;
VAR
      theErr : CMErr;                   { Problem Flag }
      sizes  : BufferSizes;             { Conn tool channel sizes }
      status : CMStatFlags;             { Conn tool states  }

BEGIN
      IF gConn <> NIL THEN BEGIN

            { Get the state of the connection }
            theErr := CMStatus(gConn, sizes, status);

            { If it's not already open or opening, then open it  }
            { In this case, open it synchronous, no timeout }

            IF BAND(status, cmStatusOpen + cmStatusOpening) = 0 THEN
                  theErr := CMOpen(gConn, FALSE, NIL, -1);

            IF theErr <> noErr THEN
                  ;      { The tool will put up its own error alert }

      END; { Good handle }
END; { DoInitiate }
```

Terminating the connection

```
PROCEDURE DoKill;
VAR
      theErr  : CMErr;                  { Error codes }
      sizes   : BufferSizes;            { Tool Channel Sizes }
      status  : CMStatFlags;            { State of the connection }

BEGIN
      IF gConn <> NIL THEN BEGIN

            { Get the connection status }
            theErr := CMStatus(gConn, sizes, status);

            { Close it only if it's open or opening }
            { In this case: synchronous, no timeout }
            IF BAND(status, cmStatusOpen + cmStatusOpening) <> 0 THEN
                  theErr := CMClose(gConn, FALSE, NIL, 0, TRUE);

            IF theErr <> noErr THEN
                  ;      { The tool will put up its own error alert }

      END; { Good Connection }
END; { DoKill }
```

Starting to send a file

```
PROCEDURE DoSend;
VAR
      theReply : SFReply;             { File Info }
      where    : Point;               { upper-left corner of File dialog }
      numTypes : INTEGER;             { File Types to display }
      typeList : SFTypeList;
      anyErr   : FTErr;               { Error handler }

BEGIN
      IF gFT <> NIL THEN BEGIN        { Good handle }

            { Set location of the SFGetFile dialog }
            SetPt(where, 100, 100);

            { If the FT tool can only send Text files, then }
            { only display text files, else display all types }

            { Check to see if Text Only flag is set}
            IF BAND(gFT^^.attributes, ftTextOnly) <> 0 THEN BEGIN
                  typeList[0] := 'TEXT';
                  numTypes := 1;
            END
            ELSE
                  numTypes := -1;

            SFGetFile(where, 'File to Send', NIL,
                      numTypes, typeList, NIL, theReply);

            { Did the user hit OK or Cancel }
            IF theReply.good THEN BEGIN

                                      { Transfer the file TO the remote }
```

```
                anyErr := FTStart(gFT,ftTransmitting,theReply);

                IF (anyErr <> noErr) THEN
                        ;       { Handle any errors here }

        END; { Good file }

    END; { Good FTHandle }

END; { DoSend }
```

Starting to receive a file

```
PROCEDURE DoReceive;
VAR
    theReply        : SFReply;          { File Info }
    anyErr          : OSErr;            { Errors on Start }

BEGIN
    IF gFT <> NIL THEN BEGIN

        { Let the FT tool use its own default file info }
        theReply.vRefNum := 0;
        theReply.fName := '';

        { Remove the search temporarily in case it }
        { comes across during the transfer }
        (*
        Use CMRemoveSearch() to get rid of the file
        transfer auto-receive string search
        *)

        { Start receiving the file }
        { The rest gets transferred in the Idle loop }

        anyErr := FTStart(gFT,ftReceiving,theReply);

        IF (anyErr <> noErr) THEN
            ;           { Handle error conditions }

    END; { Good Handle  }

END; { DoReceive }
```

Configuring a connection

```
PROCEDURE DoConnectionConfig;
VAR
      result  : INTEGER;          { Choose went OK? }
      where   : Point;            { upper-left corner of the choose dialog }
      tempStr : Str255;

BEGIN
      { Set the dialog box as close as possible to upper-left corner of screen }
      { because the dialog box will grow down and/or to the right }

      SetPt(where, 10, 40);

      IF gConn <> NIL THEN BEGIN

            { Put up the standard tool chooser }
            result := CMChoose(gConn, where, NIL);

            (*
            Handle the result here.
            If the tool has changed, need to re-add the  file
            transfer auto-receive search to the new conn tool.
            *)

      END; { Good handle }

END; { DoConnectionConfig }
```

Configuring a terminal emulation

```
PROCEDURE DoTerminalConfig;
VAR
      result : INTEGER;           { Choose went OK? }
      where  : Point;             { Upper-left corner of the choose dialog }

BEGIN
      { Set the dialog box as close as possible to top-left corner of screen }
      { because the dialog box will grow down and/or to the right }

      SetPt(where, 10, 40);

      IF gTerm <> NIL THEN BEGIN
```

```
                { Put up the standard tool chooser }
                result := TMChoose(gTerm, where, NIL);

                (*
                - Handle the result here
                *)

        END; { Good handle }

END; { DoTerminalConfig }
```

Configuring a file transfer

```
PROCEDURE DoFileTransferConfig;
VAR
        result          : INTEGER;              { User chose all right }
        where           : Point;                { upper-left corner of the dialog }
        tempString      : STR255;               { Search for FT sequence }

BEGIN
        { Set the dialog box as close as possible to top-left corner of screen }
        { because the dialog box will grow down and/or to the right }

        SetPt(where, 10, 40);

        IF gFT <> NIL THEN BEGIN

                { Put up the standard box }
                result := FTChoose(gFT, where, NIL);

                (*
                If the result = OKMajor or OKMinor, we may need to:
                   remove the old file transfer auto-receive search (if any)
                   add the new file transfer tool's auto-receive string (if any).
                *)

        END; { Good Handle }

END; { DoFileTransferConfig }
```

Making a new session document

```
PROCEDURE MakeNew;
VAR
      err                  : OSErr;           { Errors from Environ call }
      theWindow            : WindowPtr;       { Home for the terminal }
      theRect              : Rect;            { TermRect for terminal }
      sizes                : BufferSizes;     { Connection tool buffers }
      termEnvironment      : TermEnvironRec;
      termID,
      ftID,
      connID               : INTEGER;         { proc IDs for the tools }
      toolName             : Str255;          { who are they? }
      tempStr              : Str255;          { AutoReceive string for FT }

BEGIN
      { Need a home }
      theWindow := GetNewWindow(128, NIL, POINTER(-1));

      IF (theWindow = NIL) THEN BEGIN
            ;     { Handle Error }
            EXIT(MakeNew);
      END;

      SetPort(theWindow);

      { Set up the termRect/viewRect for Term tool }
      theRect := theWindow^.portRect;

      { If we have scroll bars, we'll need to inset theRect }
      { to account for their widths }

      gTerm := NIL;
      gConn := NIL;
      gFT := NIL;
      gBuffer := NIL;
      gCache := NIL;

      gStartFT := FALSE;
      gWasFT := FALSE;
```

```
{ -------------------------- }
{ New terminal tool          }
{ -------------------------- }

(*
Get the terminal tool's proc ID by calling either
CRMGetIndToolName() and/or TMGetProcID()
*)

{ New Terminal tool }
gTerm := TMNew(theRect, theRect, tmSaveBeforeClear, termID,
             theWindow, @SendProc, @CacheProc, @BreakProc,
             NIL, @TermGetConnEnvirons, 0, 0);
IF (gTerm = nil) THEN BEGIN
       { Handle error }
       Exit( MakeNew );
END;


{ -------------------------- }
{ New connection tool        }
{ -------------------------- }

{ Set the desired sizes }
sizes[cmDataIn] := 1024;  { I only want data in this example }
sizes[cmDataOut] := 1024;
sizes[cmCntlIn] := 0;     { Ignore these channels }
sizes[cmCntlOut] := 0;
sizes[cmAttnIn] := 0;
sizes[cmAttnOut] := 0;

(*
Get the connection tool's proc ID by calling either
CRMGetIndToolName() and/or CMGetProcID()
*)

{ Only want the data channel }
gConn := CMNew(connID, cmData, sizes, 0, 0);

IF (gConn = nil) THEN BEGIN
       { Handle error }
       EXIT(MakeNew);
END;
```

```
    { --------------------------- }
    { New file transfer tool      }
    { --------------------------- }

    (*
    Get the file transfer tool's proc ID by calling either
    CRMGetIndToolName() and/or FTGetProcID()
    *)

    { ReadProc & WriteProc are nil to let }
    { the tool handle the file i/o }

    gFT := FTNew(ftID, 0, @FTsendProc, @FTreceiveProc, NIL, NIL,
                 @FTGetConnEnvirons,theWindow, 0, 0);

    IF (gFT = nil) THEN BEGIN
        { Handle error }
        Exit(MakeNew);
    END;

    (*
    If the file transfer tool's auto-receive string isn't empty
    then add it with CMAddSearch(gFT,theString,flags,@AutoRecCallBack)
    *)

    gBuffer := NewPtr(1024);  { the data buffer }
    IF (gBuffer = NIL) THEN
        ; { Handle Errors }

END; { MakeNew }


{ Call Back Proc if a FT auto-receive string is found }
PROCEDURE AutoRecCallback(gConn: ConnHandle; data: Ptr; refNum: LONGINT);
BEGIN
    { We can't call FTStart() or CMRemoveSearch() here as }
    { this proc might be called from Interrupt level }

    gStartFT := TRUE;         { Set the flag to call FTStart in Idle }
END; { AutoRecCallBack }
```

Closing the session document

```
PROCEDURE DoClose(theWindow: WindowPtr);
BEGIN

      IF theWindow <> NIL THEN BEGIN
            IF gTerm <> NIL THEN
                  TMDispose(gTerm);          { Get rid of the tools }

            IF gConn <> NIL THEN
                  CMDispose(gConn);          { Tools should dispose of }
                                             { their own windows }
            IF gFT <> NIL THEN
                  FTDispose(gFT);

            IF gBuffer <> NIL THEN           { Get rid of my data space }
                  DisposPtr(gBuffer);

            DisposeWindow(theWindow);        { Get rid of the window }
      END; { Good Window }

END; { DoClose }
```

Other events

Activate events

```
PROCEDURE DoActivate(theEvent : EventRecord);
VAR
      theWindow    : WindowPtr;
      processed    : BOOLEAN;                 { Activate or Deactivate }

BEGIN
      theWindow := WindowPtr(theEvent.message);
      SetPort(theWindow);                     { Focus on the target }

      { Is this an activate or a deactivate }
      processed := BAND(theEvent.modifiers, activeFlag) <> 0;

      (*
      (Deactivate application stuff here
      *)

      { Tools need to adjust their menus, text selection, etc }
      IF gTerm <> NIL THEN
            TMActivate(gTerm, processed);     { Send message to the tool }

      IF gConn <> NIL THEN
            CMActivate(gConn, processed);     { Send message to the tool }

      IF gFT <> NIL THEN
            FTActivate(gFT, processed);       { Send message to the tool }
END; { DoActivate }
```

Resume events

```
PROCEDURE DoResume(theEvent : EventRecord);
CONST
      resumeFlag = 1;

VAR
      theWindow    : WindowPtr;
      isResume     : BOOLEAN;                 { Resume/Suspend Event }
      savedPort    : GrafPtr;

BEGIN
      GetPort(savedPort);                     { Current Focus }
```

```
        theWindow := FrontWindow;          { Get the target }

        { Tools may work in background }
        IF theWindow <> NIL THEN BEGIN
                SetPort(theWindow);

                isResume := BAND(theEvent.message, resumeFlag) <> 0;

                IF gTerm <> NIL THEN
                        TMResume(gTerm, isResume);

                IF gConn <> NIL THEN
                        CMResume(gConn, isResume);

                IF gFT <> NIL THEN
                        FTResume(gFT, isResume);

                SetPort(savedPort);
        END; { if good window }
END; { DoResume }
```

Update events

```
PROCEDURE DoUpdate(theEvent:EventRecord);
VAR
        theWindow       : WindowPtr;       { The target to update }
        savedPort       : GrafPtr;         { Temporarily saved }
        savedClip       : RgnHandle;       { Clipping for the terminal }

BEGIN
        theWindow := WindowPtr(theEvent.message);

        IF theWindow <> NIL THEN BEGIN
                savedClip := NewRgn;       { Allocating for QD }

                GetPort(savedPort);        { Change the focus }
                SetPort(theWindow);

                GetClip(savedClip);        { Save the old area }
                ClipRect(theWindow^.portRect);   { Just the window }

                BeginUpdate(theWindow);
                                           { Clear the old data }
                EraseRect(theWindow^.portRect);

                (*
                Update application stuff here
                *)
                                                { Terminal tool will redraw }
                IF gTerm <> NIL THEN
                    TMUpdate(gTerm, theWindow^.visRgn);

            EndUpdate(theWindow);

            SetClip(savedClip);                 { Put it all back }
            DisposeRgn(savedClip);              { Clean up }

            SetPort(savedPort);
        END; { Good Window }

    END; { DoUpdate }
```

Keyboard events

```
PROCEDURE DoKey(theEvent : EventRecord);
VAR
    theKey          : CHAR;                     { The character hit }
    processed       : BOOLEAN;                  { Did the app handle it }
    result          : LONGINT;                  { value MenuKey() returns }
BEGIN
    { Get the character }
    theKey := CHAR(BAND(theEvent.message, charCodeMask));

    processed := FALSE;                         { Haven't intercepted it }

    { Was it a command equivalent }
    IF BAND(theEvent.modifiers, cmdKey) <> 0 THEN BEGIN

        result := MenuKey(theKey);              { Get the key equivalent }
                                                { Valid menu key?? }
        IF theMenu <> 0 THEN BEGIN
            processed := TRUE;                  { App will redirect }
            DoCommand(result);                  { Calls the above routine }
        END; { Good Menu Equivalent }

    END; { Cmd-key down? }
```

```
      { If it wasn't a valid menu command then pass the event to the terminal }

      IF (gTerm <> NIL) AND NOT processed THEN
            TMKey(gTerm, theEvent);
END; { DoKey }
```

Mouse events

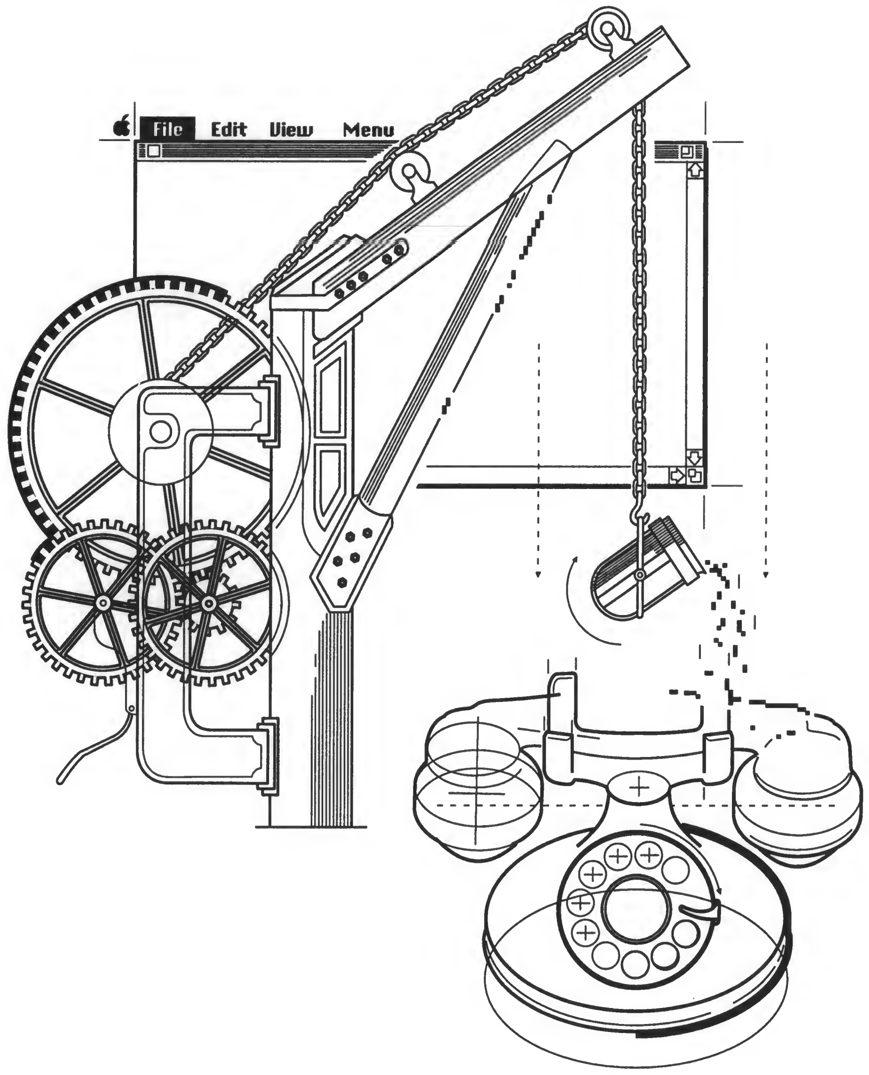
```
PROCEDURE DoClick(theEvent : EventRecord);
VAR
      theWindow : WindowPtr;                { The target }

BEGIN
                                            { Where was the click }
      thePart := FindWindow(theEvent.where, theWindow);

      CASE thePart OF
            inMenuBar: BEGIN
                                            { Get the menu info }
                        result := MenuSelect(theEvent.where);
                        DoCommand(result);  { call above routine }
                  END;

            inGrow:     BEGIN
                        { Resize the Window, scroll bars, etc. }

                                            { Tell the terminal }
                        TMResize(gTerm,theWindow^.portRect);
                  END;

            inContent:
                  IF gTerm <> NIL THEN BEGIN
                        (*
                        Call TMScroll() if the click was in a scroll bar
                        *)

                        TMClick(gTerm, theEvent); { For mouse selection }
                  END;  { valid term rec }

            otherwise
                  ;     { Perform standard event action }
      END; { case }
END; { DoClick }
```

Main program loop

```
PROCEDURE MainLoop;
VAR
      theEvent     : EventRecord;      { World Happenstances }
      theWindow    : WindowPtr;        { The desired target }

BEGIN
      WHILE NOT done DO BEGIN
            DoIdle;                    { Call our idle proc once thru }

            IF WaitNextEvent(everyEvent,theEvent, 0, NIL) THEN BEGIN

                  { get the target window }
                  CASE theEvent.what OF
                        autoKey, keyDown:
                              theWindow := FrontWindow;
                        mouseDown:
                              IF FindWindow(theEvent.where,theWindow)=0 THEN
                                    ;
                        otherwise
                              theWindow := WindowPtr(theEvent.message);
                  END; { case }

                  { All windows created by a tool are supposed to }
                  { have their RefCons = LONGINT(theToolHandle) }

                  (*
                  Call the tool event proc if the window is a tool
                  window. i.e. TMEvent()
                  *)

                  IF (theWindow <> NIL) THEN BEGIN
                        SetPort(theWindow);

                        CASE theEvent.what OF             { App Window }
                              autoKey, keyDown:
                                    { May set done to true }
                                    DoKey(theEvent);
                              mouseDown:
                                    { May set done to true }
                                    DoClick(theEvent);
                              updateEvt:
                                    DoUpdate(theEvent);
```

```
                                app4Evt:
                                        DoResume(theEvent);
                                activateEvt:
                                        DoActivate(theEvent);
                        END; { case }

                END; { Good Window }

        END; { WaitNextEvent }

    END; { while not done }

END; { DoMainLoop }
```

Chapter 3 **Connection Manager**



THIS CHAPTER describes the Connection Manager, the Communications Toolbox manager that allows applications to establish and maintain connections. This chapter describes some of the fundamental concepts about the Connection Manager. Then it describes the **connection record,** which is the most important data structure to the Connection Manager. Next, this chapter presents a detailed functional description of each routine provided by the Connection Manager. At the end of the chapter, you'll find a "Quick Reference" to routines, data structures, and routine selectors for programming in assembly language.

In this chapter, the term *your application* refers to the application you are writing for the Macintosh, which will implement communications services for users. Be careful not to confuse the services your application provides with the services that tools provide.

To use the Connection Manager, you need to be familiar with

- the Resource Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the Device Manager (described in *Inside Macintosh,* Volumes II, IV, V)

About the Connection Manager

By using Connection Manager routines, your application can implement basic connection services without having to take into account underlying connection protocols. Connection tools, which are discussed in Chapter 9, are responsible for implementing connection services according to specific protocols.

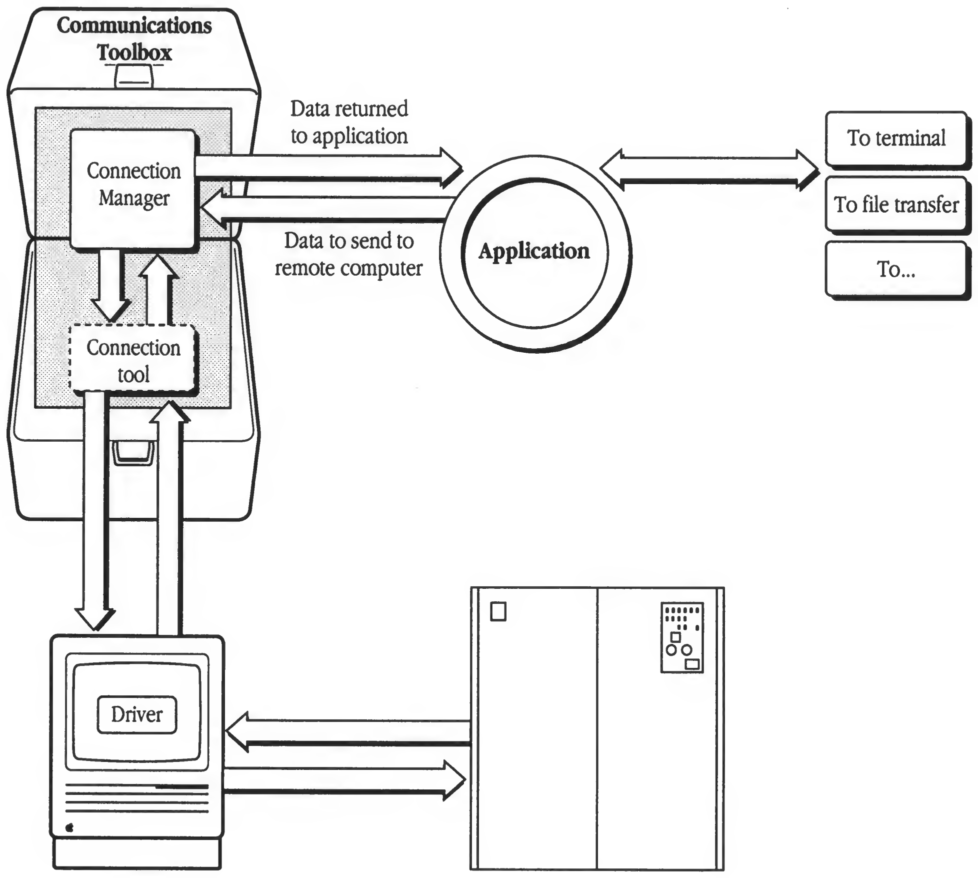
The Connection Manager provides a generic connection—a **channel** that carries data between your application and another computer process. The other process can be running on the same computer as your application or on any other computer.

Here's what happens inside the Connection Manager. An application makes a request of the Connection Manager when it needs a connection service, such as opening a connection. The Connection Manager then sends this request to one of the tools that it manages. The tool provides the service according to the specifics of the connection protocol that is implemented for the data connection. Once the tool has finished, it passes back to the application (through the manager) any relevant parameters and return codes.

The data is sent along the connection in a byte stream (a reliable byte stream, if the connection protocol supports error correction), rather than on a transaction-by-transaction basis. Although the Connection Manager does not provide flow control, error correction, error detection, and data encapsulation, a tool or application can provide these services.

Figure 3-1 shows the data flow into and out of the Connection Manager.

■ **Figure 3-1** Data flow into and out of the Connection Manager



The most important data structure maintained by the Connection Manager is the connection record, which stores all the specifics about a connection. For example, the connection record might show that a connection takes place over a direct serial port connection transmitting at 9,600 bits per second.

One important aspect of the connection record is that it allows for protocol-independent routines. Protocol-independent routines allow applications to use Connection Manager services without regard for the underlying communications protocols. In other words, when an application wants to read data from a remote **entity,** it tells the Connection Manager to read, and the connection tool figures out exactly how to implement a read operation on a given connection.

Another important feature of the connection record is that it lets you use multiple instances of the same tool. The same tool can be used by different processes at the same time, like in a MultiFinder environment, or by different threads in a given application.

The connection record is described in greater detail later in this chapter.

Besides providing basic connection routines, the Connection Manager includes routines that make it easy for your application to configure a connection tool, either by presenting the user with a dialog box or by interfacing directly with a scripting language. The Connection Manager also contains routines that make it easier for you to localize your applications in other languages.

You can use the Connection Manager with other Communications Toolbox managers to create a communications application with file transfer and terminal emulation capabilities. Or, you can use the Connection Manager with some other data-transfer or terminal emulation service. You can also write your own connection tool for the Connection Manager to use. (This procedure is discussed in Chapters 8 and 9.) Regardless of which method you choose, your application should be able to handle different connection tools such that users can change tools and still be able to use your program.

Connection channels: data, attention, and control

When data is sent along a connection, there is a certain amount of overhead that sometimes accompanies it. This "extra" information could be a warning that the connection is about to go down or that the sending entity should slow its rate of transmitting data. Some connection protocols are designed in such a way that this sort of information can be sent simultaneously with the data stream on a channel. The Connection Manager supports up to three channels on each connection—data, attention, and control—that can be thought of as three separate lines of communication between each entity. The data channel, however, is for all protocols the primary channel for transmitting information between entities. The other two channels are used by only some connection protocols.

When you design your application, keep in mind that some protocols support all three channels, whereas others support only one (the data channel). Your application should be able to handle different connection tools in a way that allows users to change tools and still be able to use your program.

The connection record

The connection record contains information that describes a connection, as well as pointers to Connection Manager internal data structures. The Connection Manager uses this information to "translate" the protocol-independent routines used by an application into a service implemented according to a specified protocol. Most of the fields in the connection record are filled in when an application calls `CMNew`, described later in this chapter.

Because the connection record describes how communications take place on a given connection, an application can communicate on more than one connection at the same time. All the application has to do is create a new connection record every time it initiates a new connection.

△ **Important** Your application, in order to be compatible with future releases of the Connection Manager, should not directly manipulate the fields of the connection record (with the exception of `config` and `oldConfig`). The Connection Manager provides routines that applications and tools can use to change connection record fields. These routines are discussed later in this chapter. △

Connection record data structure

```
TYPE
        ConnHandle          =       ^ConnPtr;
        ConnPtr             =       ^ConnRecord;
        ConnRecord          =       RECORD
                procID      :       INTEGER;

                flags       :       CMRecFlags;
                errCode     :       CMErr;

                refCon      :       LONGINT;
                userData    :       LONGINT

                defProc     :       ProcPtr;

                config      :       Ptr;
                oldConfig   :       Ptr;

                reserved0   :       LONGINT;
                reserved1   :       LONGINT;
                reserved2   :       LONGINT;

                cmPrivate   :       Ptr;

                bufferArray :       CMBuffers;
                bufSizes    :       CMBufferSizes;
```

```
            mluField     :      LONGINT;

            asyncCount   :      CMBufferSizes;

        END;
```

procID

`procID` is the connection tool ID. This value is dynamically assigned by the Connection Manager when your application calls `CMGetProcID`.

flags

`flags` is a bit field that indicates certain specifics about a connection when the connection record is first created. The bit masks for `flags` are as follows:

```
TYPE
      CMRecFlags     =      LONGINT;


CONST
      cmData         =      $00000001;
      cmCntl         =      $00000002;
      cmAttn         =      $00000004;

      cmDataClean    =      $00000100;
      cmCntlClean    =      $00000200;
      cmAttnClean    =      $00000400;

      cmNoMenus      =      $00010000;
      cmQuiet        =      $00020000;
```

Your application can turn on the `CMNoMenus` or `CMQuiet` bits when it calls `CMNew` (discussed later in this chapter). The connection tool will set the rest of these bits.

If the tool sets the `cmData`, `cmCntl`, or `cmAttn` bit, your application can use a data, control, or attention channel. If the tool sets the `cmDataClean`, `cmCntlClean`, or `cmAttnClean` bit, your application can use a reliable (error-free, in-order-delivery) data, control, or attention channel.

The connection tool will not display any custom menus if your application sets the `cmNoMenus` bit. The connection tool will not display any status dialog boxes or error alerts if your application sets the `cmQuiet` bit. If your application turns the `cmQuiet` bit on, it is responsible for displaying status dialog boxes and error alerts that the tool would have displayed. Applications typically use these two bits to hide the connection tool from the user.

errCode

`errCode` contains the last error encountered by the Connection Manager. Valid error codes are as follows:

```
TYPE
        CMErr               =       OSErr;

CONST
        cmGenericError      =       -1;
        cmNoErr             =       0;
        cmRejected          =       1;
        cmFailed            =       2;
        cmTimeOut           =       3;
        cmNotOpen           =       4;
        cmNotClosed         =       5;
        cmNoRequestPending  =       6;
        cmNotSupported      =       7;
        cmNoTools           =       8;
```

refCon

`refCon` is a four-byte field that your application can use.

userData

`userData` is a four-byte field that your application can use.

defProc

`defProc` is a procedure pointer to the main code resource of the connection tool that will implement the connection protocol. The connection tool's main code resource is of type `'cdef'`.

config

`config` is a pointer to a data block that is private to the connection tool. It can contain information like data transfer rate or parity for direct asynchronous connections, phone numbers for modem connections, or an address for an AppleTalk® connection; the contents vary from tool to tool.

Your application can store the contents of `config` to save the state of a connection in a document. The structure, size, and contents of the configuration record are set by the tool. Your application can determine the size of the configuration record by calling `GetPtrSize`, overwrite its contents using `BlockMove`, and validate the contents with `CMValidate`.

Your application can use `CMGetConfig` and `CMSetConfig` to manipulate fields in this record. For details, see "Interfacing with a Scripting Language," later in this chapter.

You can find more information about `config` from a connection tool perspective in Chapter 8.

oldConfig

`oldConfig` is a pointer to a data block that is private to the connection tool and contains the most recently saved version of `config`. Your application is responsible for setting `oldConfig` when the user saves a session document.

reserved0, reserved1, and **reserved2**

`reserved0`, `reserved1`, and `reserved2` are fields that are reserved for the Connection Manager. Your application must not use these fields.

cmPrivate

`cmPrivate` is a pointer to a data block that is private to the connection tool. Your application must not use this field.

bufferArray

`bufferArray` is a set of pointers to buffers for the data, control, and attention channels. These are the buffers that are used to read data to or write data from the entity. These buffers are allocated by the connection tool and are the exclusive property of the connection tool; your application should not use these buffers. The data type for `bufferArray` is `CMBuffers` and is defined under the description of `bufSizes`.

bufSizes

`bufSizes` contains the actual sizes of the buffers and it, too, should not be manipulated directly by an application. The data type for `bufSizes` is `CMBufferSizes`, and is defined as follows:

```
TYPE
        CMBufFields=(
                cmDataIn,
                cmDataOut
                cmCntlIn
                cmCntlOut
                cmAttnIn
                cmAttnOut
                cmRsrvIn
                cmRsrvOut);

        CMBuffers           =       ARRAY[CMBufFields] OF Ptr;
        CMBufferSizes       =       ARRAY[CMBufFields] OF LONGINT;
```

mluField

`mluField` is a pointer to a private data structure that the Connection Manager uses when searching the data stream.

asyncCount

`asyncCount` is used by **completion routines** to determine how many bytes were actually transmitted or received on a particular channel. Completion routines are discussed in more detail later in this chapter.

Connection Manager routines

The following sections describe the routines that tools and applications can use to access Connection Manager services. These routines are protocol independent; your application does not need to be familiar with the specifics of a particular communications protocol in order to use the connection. Your application can call three Connection Manager routines from interrupt level: `CMRead`, `CMWrite`, and `CMStatus`. The other routines can not be called from interrupt level.

Below is a listing of the routines described in this section in the order in which they are presented.

Preparing to open a connection

Before your application can open a connection, it must initialize the Connection Manager (by calling `InitCM`), find out the `procID` of the tool it requires (by calling `CMGetProcID`), create a connection record (by calling `CMNew`), and then configure the connection tool (by restoring `config` from a saved document; or by calling `CMChoose`, the connection tool custom configuration routines, or `CMSetConfig`).

InitCM

Initializing the Connection Manager

`InitCM` initializes the Connection Manager. Your application should call this routine only once, after calling the standard Macintosh Toolbox initialization routines.

▲ **Warning** Your application must initialize the **Communications Resource Manager** (by calling `InitCRM`) and then the Communications Toolbox Utilities (by calling `InitCTBUtilities`), whether or not it uses any of their calls, before it initializes the Connection Manager. ▲

Function

```
InitCM  :  CMErr;
```

Description

`InitCM` returns an operating-system error code if appropriate. Valid values are:

```
TYPE
     CMErr                  =      OSErr;

CONST
     cmGenericError         =     -1;
     cmNoErr                =      0;
     cmRejected             =      1;
     cmFailed               =      2;
     cmTimeOut              =      3;
     cmNotOpen              =      4;
     cmNotClosed            =      5;
     cmNoRequestPending     =      6;
     cmNotSupported         =      7;
     cmNoTools              =      8;
```

Your application must check for the presence of the CommToolbox before calling this function. Sample code under "Determining Whether the Managers are Installed" in Appendix B shows you how your application can make this check.

Getting current `procID` information

Your application should call `CMGetProcID` just before creating a new connection record, to find out the `procID` of a tool.

Function

```
CMGetProcID(name: Str255): INTEGER;
```

Description

`name` specifies a connection tool. If there is a connection tool in the folder named *Communications Folder* with the specified `name`, its `procID` is returned. If `name` references a nonexistent connection tool, –1 is returned.

Creating a connection record

Before your application can open a connection, it must create a connection record so the Connection Manager knows what type of connection to establish. `CMNew` creates a new connection record; fills in the fields that it can, based upon the parameters that were passed to it; and returns a handle to the new record in `ConnHandle`. `CMNew` automatically makes two calls to `CMDefault` (which is described later in this chapter) to fill in `config` and `oldConfig`. The Connection Manager then loads the connection tool main code resource, moves it high in the current heap, and locks it. If an error occurs that prevents a new connection record from being created (for example, running out of memory), `CMNew` passes back `NIL` in `ConnHandle`.

Function

```
CMNew(procID : INTEGER; flags : CMRecFlags; desiredSizes :
CMBufferSizes; refCon : LONGINT; userData : LONGINT) :
ConnHandle;
```

Description

`procID` is dynamically assigned by the Connection Manager to tools at run time. Applications should not store `procID` values in settings files. Instead, they should store tool names, which can be converted to `procID` values with the `CMGetProcID` routine. Your application should use the ID that `CMGetProcID` returns for `procID`.

`flags` is a bit field with the following masks:

```
CONST
    cmData       =    $00000001;
    cmCntl       =    $00000002;
    cmAttn       =    $00000004;

    cmDataClean  =    $00000100;
    cmCntlClean  =    $00000200;
    cmAttnClean  =    $00000400;

    cmNoMenus    =    $00010000;
    cmQuiet      =    $00020000;
```

`flags` represents a request from your application for a level of connection service. If your application sets `cmNoMenus`, the connection tool will not display any custom menus. If your application sets `cmQuiet`, the connection tool will not display any windows. Applications typically use these bits to hide the connection tool from the user.

The connection tool sets the other bits, and returns in the `flags` field of the connection record the level of connection service that it grants your application. The `flags` field is discussed in "Connection Record Data Structure," earlier in this chapter.

Apple Computer has reserved the bits of `flags` not shown in this manual. Do not use them, or your code may not work in the future.

`desiredSizes` specifies buffer sizes that your application requests for its read, write, control read, control write, attention read, and attention write channels. Your application can specify the sizes that it wants when it calls `CMNew`, but the connection tool might not provide the requested sizes. To have the tool set the size of these buffers, your application should put zeros in the array. These buffers become the exclusive property of the connection tool and should not be manipulated by the application in any way. The actual buffer sizes are kept in the `bufSizes` field of the connection record.

`refCon` and `userData` are fields that your application can use.

CMDefault

Initializing the configuration record

`CMDefault` fills the specified configuration record with the default configuration specified by the connection tool. `CMNew` calls this procedure automatically when it fills in the `config` and `oldConfig` fields in a new connection record.

Procedure

```
CMDefault(VAR theConfig: Ptr; procID: INTEGER; allocate:
BOOLEAN);
```

Description If `allocate` is `TRUE`, the tool allocates space for `theConfig` in the current heap zone.

CMValidate

Validating the configuration record

`CMValidate` performs an internal consistency check on the configuration and private data records of the connection record. `CMNew` and `CMSetConfig` call this routine after they have created a new connection record, to make sure that the record contains values identical to those specified by the connection tool.

Function

```
CMValidate(hConn: ConnHandle): BOOLEAN;
```

Description If the validation fails, the Connection Manager returns `TRUE` and the tool fills the configuration record with default values by calling `CMDefault`.

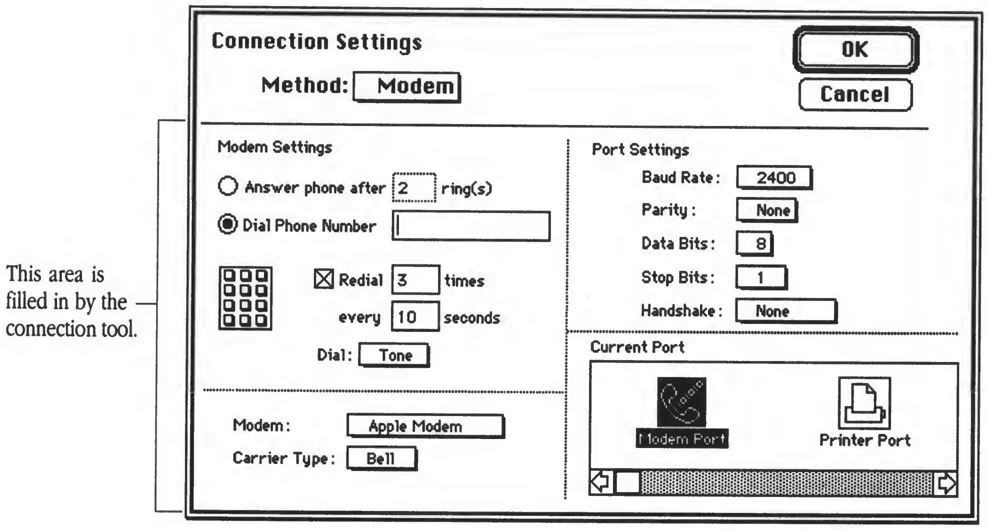
Your application can call this routine after restoring a configuration, to verify that the connection record contains the correct information, in a manner similar to that shown next.

```
BlockMove(saveConfig,hConn^^.config,GetPtrSize(hConn^^.config));
IF CMValidate(hConn) THEN BEGIN
     { validate failed }
     END
     ELSE BEGIN
            { validate succeeded }
            END
```

Configuring a connection tool

An application can configure a connection tool in one of three ways. The easiest and most straightforward way is by calling the `CMChoose` routine. This routine presents the user with a dialog box similar to the one shown in *Figure 3-2.*

■ **Figure 3-2** The standard tool-settings dialog box



Connection Settings

Method: Modem

Modem Settings

○ Answer phone after 2 ring(s)

● Dial Phone Number

☒ Redial 3 times every 10 seconds

Dial: Tone

Modem: Apple Modem

Carrier Type: Bell

Port Settings

Baud Rate:	2400
Parity:	None
Data Bits:	8
Stop Bits:	1
Handshake:	None

Current Port

Modem Port

Printer Port

The second way an application can configure a connection tool is by presenting the user with a custom tool-settings dialog box. This method is much more difficult, and involves calling six routines. The routines are described in the next section, "Custom Configuration of a Connection Tool," and "The Custom Tool-Settings Dialog Box" in Appendix B provides example code.

The third way your application can configure a connection tool is by using the scripting language interface, described in "Interfacing With a Scripting Language," later in this chapter. This method allows your application to bypass user interface elements.

Function

```
CMChoose(VAR hConn:ConnHandle; where: Point; idleProc:
ProcPtr): INTEGER;
```

Description

`where` is the point, specified in global coordinates, where the upper-left corner of the dialog box should appear. It is recommended that your application place the dialog box as close as possible to the upper-left corner of the screen, because the size of the dialog box varies from tool to tool.

`idleProc` is a procedure with no parameters that the Connection Manager will automatically call every time `CMChoose` calls the setup dialog box **filter procedure.** Pass `NIL` if your application has no `idleProc`.

`CMChoose` returns one of the following values:

```
CONST
     chooseDisaster     =     -2;
     chooseFailed       =     -1;
     chooseAborted      =      0;
     chooseOKMinor      =      1;
     chooseOKMajor      =      2;
     chooseCancel       =      3;
```

`chooseDisaster` means that the `CMChoose` operation failed, destroyed the connection record, and returned `NIL` in the connection handle.

`chooseFailed` means that the `CMChoose` operation failed and the connection record was not changed.

`chooseAborted` means that the user started to change the connection while it was still open but changed their mind. When users try to change connection tools while the connection is still open, the Connection Manager prompts them with a dialog box that asks if they want to make the change. If the user clicks No in this dialog box, the `CMChoose` routine returns `chooseAborted`.

`chooseOKMinor` means that the user clicked OK in the dialog box but did not change the connection tool being used.

`chooseOKMajor` means that the user selected OK in the dialog box and also changed the connection tool being used. The Connection Manager then destroys the old connection handle by calling `CMDispose`. The connection is closed down, all pending read and write operations are terminated, and a new connection handle is returned in `hConn`.

`chooseCancel` means that the user clicked Cancel in the dialog box.

Custom configuration of a connection tool

Your application creates a custom tool-settings dialog box and presents it to the user by using the six Connection Manger routines: `CMSetupPreflight`, `CMSetupSetup`, `CMSetupFilter`, `CMSetupItem`, `CMSetupCleanup`, and `CMSetupPostflight`. Using these routines is more involved than calling `CMChoose`, but they provide your application with much more flexibility. Refer to the code sample in "The Custom Tool-Settings Dialog Box" in Appendix B to see how an application calls these routines.

To build a list of available connection tools, use the routine `CRMGetIndToolName`, which is described in Chapter 6.

`CMSetupPreflight`

Setting up the custom tool-settings dialog box

`CMSetupPreflight` returns a handle to a dialog item list that your application appends to the custom tool-settings dialog box. The handle comes from the connection tool. (The calling application uses `AppendDITL`, discussed in Chapter 7.) This handle is not a resource handle. Your application is responsible for disposing of the handle when done with it.

The connection tool can use `CMSetupPreflight` to allocate a block of private storage, and to store the pointer to that block in `magicCookie`. The `magicCookie` value should be passed to the other routines that are used to set up the custom tool-settings dialog box.

Function

```
CMSetupPreflight(procID: INTEGER; VAR magicCookie: LONGINT):
Handle;
```

Description

`procID` is the ID for the connection tool that is being configured. Your application should get this value by using the `CMGetProcID` routine, discussed earlier in this chapter.

◆ *Note:* The `refcon` of the custom tool-settings dialog box should point to a data structure (shown next) in which the first two bytes are the tool `procID` and the next four bytes are `magicCookie`. `UserItem` routines, for example, may require `procID` to obtain tool resources.

```
TYPE
    chooseDLOGdata      =      RECORD
           procID       :      INTEGER
           magicCookie  :      LONGINT
END;
```

Setting up custom tool-settings dialog box items

`CMSetupSetup` tells the connection tool to set up controls (like radio buttons or check boxes) in the dialog item list returned by `CMSetupPreflight`.

Procedure

```
CMSetupSetup(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR magicCookie: LONGINT);
```

Description

`procID` is the ID for the connection tool that is being configured. Your application should use the same value for `procID` as it passed to `CMSetupPreflight`.

`theConfig` is a pointer to a configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box in which configuration is taking place.

`magicCookie` is a pointer to private storage for the connection tool.

Filtering custom tool-settings dialog box events

Your application calls `CMSetupFilter` as a filter procedure before it calls the standard modal dialog box filter procedure for the custom tool-settings dialog box. This routine allows connection tools to filter events in the custom tool-settings dialog box.

Function

```
CMSetupFilter(procID: INTEGER; theConfig: Ptr; count:INTEGER;
theDialog: DialogPtr; VAR theEvent: EventRecord; VAR theItem:
INTEGER; VAR magicCookie: LONGINT): BOOLEAN;
```

Description

`procID` is the ID for the connection tool that is being configured. Your application should use the same value for `procID` as it passed to `CMSetupPreflight`.

`theConfig` is a pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`theEvent` is the event record for which filtering is to take place.

`theItem` can return the item clicked in the dialog box.

`magicCookie` is a pointer to private storage for the connection tool.

If the event passed in was handled, `CMSetupFilter` returns `TRUE`. `FALSE` indicates that your application should perform standard dialog box filtering.

Processing custom tool-settings dialog box events

`CMSetupItem` processes events for controls in the custom tool-settings dialog box.

Procedure

```
CMSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie:
LONGINT);
```

Description

`procID` is the ID for the connection tool being configured. Your application should use the same value for `procID` as it passed to `CMSetupPreflight`.

`theConfig` is a pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`theItem` is the item clicked in the dialog box. This value can be modified and sent back.

`magicCookie` is a pointer to private storage for the connection tool.

Performing clean-up operations

`CMSetupCleanup` disposes of any storage allocated in `CMSetupPreflight` and performs other clean-up operations. If your application needs to shorten a dialog box, it should do so after calling this routine.

Procedure

```
CMSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR magicCookie: LONGINT);
```

Description

`procID` is the ID for the connection tool that is being configured. Your application should use the same value for `procID` as it passed to `CMSetupPreflight`.

`theConfig` is a pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`magicCookie` is a pointer to private storage for the connection tool.

Closing the tool file

`CMSetupPostflight` closes the tool file if it is not being used by any sessions.

Procedure `CMSetupPostflight(procID:INTEGER);`

Description `procID` is the ID for the connection tool that is being configured. Your application should use the same value for `procID` as it passed to `CMSetupPreflight`.

Interfacing with a scripting language

Your application does not have to rely on users making selections from dialog boxes in order to configure a connection tool. `CMGetConfig` and `CMSetConfig` provide the services that your application needs to interface with a scripting language.

`CMGetConfig`

Getting the configuration string

`CMGetConfig` gets a configuration string from the connection tool.

Function `CMGetConfig(hConn: ConnHandle): Ptr;`

Description `CMGetConfig` returns a null-terminated, C-style string from the connection tool containing tokens that fully describe the configuration of the connection record. For an example, see the description of the next routine. If an an error occurs, `CMGetConfig` returns `NIL`.

It is the responsibility of your application to dispose of `Ptr`.

`CMSetConfig`

Setting the configuration with a string

`CMSetConfig` passes a configuration string to the connection tool.

Function `CMSetConfig(hConn: ConnHandle; thePtr: Ptr): INTEGER;`

Description `CMSetConfig` passes a null-terminated, C-style string (see the example string later in this section) to the connection tool for parsing. The string is pointed to by `thePtr` and must contain tokens that describe the configuration of the connection record. The string can be any length.

`CMSetConfig` ignores items it does not recognize or find relevant; such an occurrence causes the connection tool to stop parsing the string and to return the character position where the error occurred. If the connection tool successfully parses the string, it returns `cmnoErr`. If the connection tool does not successfully parse the string, it returns one of the following values: a number less than –1 to indicate an `OSErr`, –1 to indicate an unknown error, or a positive number to indicate the character position where parsing was stopped.

Individual connection tools are responsible for the parsing operation.

Sample *A null-terminated, C-style configuration string*

```
Baud 9600 dataBits 8 Parity None StopBits 1 Port "Modem Port"
Handshake None HoldConnection False RemindDisconnect False\0
```

Opening, using, and closing the connection

Once your application has performed the required tasks described in the previous sections, it can open and use a connection.

`CMOpen`

Opening a connection

`CMOpen` attempts to open a connection, based on information contained in a connection record.

Function

```
CMOpen(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr;
timeout: LONGINT): CMErr;
```

Description

`hConn` points to the connection record for the new connection.

`async` specifies whether or not the opening request is asynchronous. If your application makes an asynchronous request, `CMOpen` returns `cmNoErr` immediately.

`completor` specifies the completion routine to be called upon completion of an asynchronous open request. Completion routines are discussed in greater detail later in this chapter, in the section "Completion Routines."

`timeout` specifies a time period, in ticks, within which `CMOpen` must be completed before the connection tool returns a `cmTimeOut` error. For no timeout, use –1. For a single attempt to open the connection, use 0. Some connection tools ignore this parameter.

If no error occurs during the open attempt, `CMOpen` returns `cmNoErr`. `CMOpen` returns a negative number if an operating-system error occurred, or a positive number if a Connection Manager error occurred.

`CMClose`

Closing a connection

`CMClose` closes a connection that is already open or in the process of opening.

Function

```
CMClose(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr;
timeout: LONGINT; now: BOOLEAN): CMErr;
```

Description

`async` specifies whether or not the close request is asynchronous. If your application requests an asynchronous close, `CMClose` returns `noErr` immediately.

`completor` specifies the completion routine to be called upon completion of an asychronous close request. Completion routines are discussed in greater detail later in this chapter, in the section "Completion Routines."

`timeout` specifies a time period, in ticks, within which the close operation must be completed before the connection tool returns a `cmTimeOut` error. For no timeout, use –1. For a single try to close the connection, use 0. Some connection tools ignore this parameter.

When `now` is `TRUE`, the connection tool closes the connection immediately. When `now` is `FALSE`, the connection tool waits until all pending input and output have completed before closing the connection.

`CMAbort`

Aborting a connection

`CMAbort` tells the Connection Manager to stop trying to complete a pending asynchronous open request. Any open completion routines are executed. Your application can also call this routine to stop an outstanding `CMListen`.

Function

```
CMAbort(hConn: ConnHandle): CMErr;
```

Description

`hConn` specifies the connection this routine affects.

`CMDispose`

Disposing of a connection record

`CMDispose` disposes of the connection record and all associated data structures. It is up to the connection tool to decide whether or not to wait for all pending read and write operations to complete before closing and disposing of the connection.

Procedure `CMDispose(hConn: ConnHandle);`

Description `hConn` specifies the connection record disposed of by this routine.

`CMIdle`

Idle procedure

Your application should call `CMIdle` at least once every time it goes through its main event loop, so that the connection tool can perform idle-loop tasks.

Procedure `CMIdle(hConn: ConnHandle);`

Description `hConn` specifies the connection for which idle-loop tasks are to be performed.

`CMListen`

Listening for incoming connection requests

`CMListen` "listens" for a connection request from another entity. Your application, after it calls `CMListen`, should call `CMStatus` (which is described later in this section) to see if a connection request has been received (by checking the `cmStatusIncomingCallPresent` bit).

Function

```
CMListen(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr;
timeout: LONGINT): CMErr;
```

Description `async` specifies whether or not the opening request is asynchronous. If your application makes an asynchronous request, `CMListen` returns `cmNoErr` immediately. If your application makes a synchronous request, `CMListen` stays in a "listen loop" until it receives the connection request.

`completor` specifies the completion routine that the Connection Manager calls after it is done listening for the connection request. Completion routines are called only after asynchronous calls to `CMListen`. "Completion Routines," later in this chapter, discusses completion routines in more detail.

`timeout` specifies a time period, in ticks, within which a connection request must be received before the connection tool returns a `cmTimeOut` error. For no timeout, use –1. For a single listen, use 0. Some connection tools ignore this parameter.

Getting connection status information

`CMStatus` returns a variety of useful status information about a connection. Your application can call this routine at interrupt level.

Function

```
CMStatus(hConn: ConnHandle; VAR sizes: CMBufferSizes; VAR
flags: CMStatFlags): CMErr;
```

Description

`sizes` is variable of type `CMBufferSizes` that contains the number of characters to be read or written on the data, control, and attention channels. The indexes of the array are as follows:

```
cmDataIn, cmDataOut, cmCntlIn, cmCntlOut, cmAttnIn, cmAttnOut,
cmRsrvIn, cmRsrvOut.
```

`flags` is a bit field with the following masks:

```
CONST
                                     {tool is opening connection}
    cmStatusOpening               =  $00000001;
                                     {connection is open}
    cmStatusOpen                  =  $00000002;
                                     {tool is closing connection}
    cmStatusClosing               =  $00000004;
                                     {data present on data channel}
    cmStatusDataAvail             =  $00000008;
                                     {data present on cntl channel}
    cmStatusCntlAvail             =  $00000010;
                                     {data present on attn channel}
    cmStatusAttnAvail             =  $00000020;
                                     {data read pending}
    cmStatusDRPend                =  $00000040;
                                     {data write pending}
    cmStatusDWPend                =  $00000080;
                                     {cntl read pending}
    cmStatusCRPend                =  $00000100;
                                     {cntl write pending}
    cmStatusCWPend                =  $00000200;
                                     {attn read pending}
    cmStatusARPend                =  $00000400;
                                     {attn write pending}
    cmStatusAWPend                =  $00000800;
                                     {tool is breaking the connection}
    cmStatusBreakPending          =  $00001000;
                                     {tool is "listening" for data}
    cmStatusListenPend            =  $00002000;
                                     {call waiting for tool to handle}
    cmStatusIncomingCallPresent =  $00004000;

TYPE
    CMStatFlags                   =  LONGINT;
```

CMAccept

Accepting or rejecting a connection request

CMAccept accepts or rejects an incoming connection request.

Function

```
CMAccept(hConn:ConnHandle;  accept:BOOLEAN):  CMErr;
```

Description

Typically, an application will perform some actions after a CMListen, the results of which determine whether or not to accept the request. CMAccept cannot be called from interrupt level.

CMIOKill

Stopping an asynchronous input/output request

CMIOKill terminates any pending input/output (I/O) requests on the specified channel.

Function

```
CMIOKill(hConn: ConnHandle; which: INTEGER): CMErr;
```

Description

which indicates the channel, and can take one of the following values:

```
cmDataIn, cmDataOut, cmCntlIn, cmCntlOut, cmAttnIn, cmAttnOut,
cmRsrvIn, cmRsrvOut.
```

CMReset

Resetting the connection

`CMReset` causes the connection to be reset. The exact state to which the connection is reset depends upon the connection protocol being implemented. The connection tool clears all local read and write buffers.

Procedure

```
CMReset(hConn: ConnHandle);
```

CMBreak

Sending breaks

`CMBreak` effects a break operation upon the connection. The exact effect of this operation depends upon the tool in use.

Procedure

```
CMBreak(hConn: ConnHandle; duration: LONGINT; async: BOOLEAN;
completor: ProcPtr);
```

Description

`duration` specifies in ticks the length of the break.

`completor` specifies the completion routine to be called upon completion of the break. Completion routines are called only after asychronous calls to `CMBreak`. "Completion Routines," later in this chapter, discusses completion routines in more detail.

Getting the connection environment

`CMGetConnEnvirons` provides a means for obtaining connection environment information.

Function

```
CMGetConnEnvirons (hConn : ConnHandle; VAR theEnvirons :
ConnEnvironRec) : CMErr;
```

Description

`CMGetConnEnvirons` returns the connection environment record in `theEnvirons` for the connection specified by `ConnHandle`. The connection tool is responsible for filling in each field of `ConnEnvironRec` with either a value (if it has a valid value to supply) or 0.

The structure for version 0 of the connection environment record is as follows:

```
TYPE
    ConnEnvironRecPtr    =   ^ConnEnvironRec;
    ConnEnvironRec       =   RECORD;
         version         :   INTEGER;
                             {version of this data structure}
         baudRate        :   LONGINT;
                             {data transfer rate}
         dataBits        :   INTEGER;
                             {number of significant bits per byte}
         channels        :   CMChannel;
                             {supported channels}
         swFlowControl   :   BOOLEAN;
                             {if software flow control is in use}
         hwFlowControl   :   BOOLEAN;
                             {if hardware flow control is in use}
         flags           :   CMFlags;
    END;
```

The `version` field takes on the following value:

```
CONST
    curConnEnvRecVers    =     0;
```

The `flags` field of the `ConnEnvironRec` is a bit field with the following value:

```
TYPE
    CMFlags              =     INTEGER;

CONST
    cmFlagsEOM           =     $0001;
```

Other bits of `flags` are reserved by Apple Computer `channels` is a bit field with the following values:

```
TYPE
    CMChannel     =     INTEGER;

CONST
    cmData        =     $00000001;
    cmCntl        =     $00000002;
    cmAttn        =     $00000004;

    cmDataClean   =     $00000100;
    cmCntlClean   =     $00000200;
    cmAttnClean   =     $00000400;
```

Other bits of `channels` are reserved by Apple Computer

Reading and writing data

The Connection Manager provides routines that read from and write data to a buffer. Your application can also use the Connection Manager routine that reads data, `CMRead`, to search the incoming data stream for a specified pattern of bytes. Data stream searching is discussed later in this chapter in the section "`CMAddSearch:` Adding a Data Stream Search."

CMRead

Reading data

`CMRead` reads data into a block of memory. Your application can not queue multiple read requests for the same channel on the same connection. However, your application can have both a pending read and a pending write on the same channel at the same time. Your application can call this routine at interrupt level.

◆ *Note:* Your application should *not* check for an open channel prior to reading data. The connection tool might be interpreting data locally and, therefore, not need an open connection.

Function

```
CMRead(hConn: ConnHandle; theBuffer: Ptr; VAR toRead: LONGINT;
theChannel: CMChannel; async: BOOLEAN; completor: ProcPtr;
timeout: LONGINT; VAR flags: CMFlags): CMErr;
```

Description

`theBuffer` specifies the buffer to which the connection tool should read data.

`toRead` specifies the number of bytes to be read. If your application calls this routine synchronously, the connection tool returns the actual number of bytes it read in `toRead`. Your application can call `CMStatus` to see if an asychronous read is pending. If your application calls this routine asynchronously, the `asyncCount` field of the connection record contains the actual number of bytes read when the connection tool calls the completion routine.

`theChannel` specifies the channel on which reading takes place. Acceptable values are as follows:

```
CONST
    cmData      =     $00000001;
    cmCntl      =     $00000002;
    cmAttn      =     $00000004;
```

`async` specifies whether or not the request is asynchronous. If an asynchronous request is made, `cmNoErr` is returned immediately.

`completor` specifies the completion routine to be called upon completion of an asynchronous read request. Completion routines are discussed in greater detail later in this chapter in the section "Completion Routines."

`timeout` specifies a time period, in ticks, within which the connection tool must complete the read operation. If it does not complete within the specified time, a timeout error occurs. For no timeout, use –1. If your application specifies 0, the connection tool reads as many bytes, up to `toRead` bytes, as it can in one read attempt. Some connection tools ignore this parameter.

`flags` indicates whether or not your application received an end-of-message indicator. If your application calls this routine asynchronously, the connection tool returns the end of message indicator in the `reserved0` field of the connection record when the completion routine is called.

```
CONST
     cmFlagsEOM    =      $0001;
```

Writing data

`CMWrite` writes data from a block of memory. Your application can not queue multiple write requests for the same channel on the same connection. However, your application can have both a pending read and a pending write on the same channel at the same time. Your application can call this routine at interrupt level.

◆ *Note:* Your application should *not* check for an open channel prior to writing data. The connection tool might be interpreting data locally and, therefore, not need an open connection.

Function

```
CMWrite(hConn: ConnHandle; theBuffer: Ptr; VAR toWrite:
LONGINT; theChannel: CMChannel; async: BOOLEAN; completor:
ProcPtr; timeout: LONGINT; flags: CMFlags): CMErr;
```

Description

`theBuffer` specifies the buffer from which the connection gets the data to write.

`toWrite` specifies the number of bytes to be written. If your application calls this routine synchronously, the connection tool returns the actual number of bytes it wrote in `toWrite`. Your application can call `CMStatus` to see if an asychronous write is pending. If your application calls this routine asynchronously, the `asyncCount` field of the connection record contains the actual number of bytes written when the completion routine is called.

`theChannel` specifies the channel on which writing takes place. Acceptable values are as follows:

```
CONST
     cmData      =     $00000001;
     cmCntl      =     $00000002;
     cmAttn      =     $00000004;
```

`async` specifies whether or not the request is asynchronous. If your application makes an asynchronous request, `CMWrite` returns `cmNoErr` immediately.

`completor` specifies the completion routine to be called upon completion of an asynchronous write request. Completion routines are discussed in greater detail later in this chapter in the section “Completion Routines.”

`timeout` specifies a time period, in ticks, within which the connection tool must complete the write operation. If it does not complete within the specified period, a timeout error occurs. For no timeout, use –1. If your application specifies 0, the connection tool writes as many bytes, up to `toWrite` bytes, as it can in one write attempt. Some connection tools ignore this parameter.

`flags` indicates whether or not the connection tool should send an end-of-message indicator. An end-of-message indicator needs to be supported by the particular communications protocol being used; if an end-of-message indicator is not supported by the connection protocol, your application should ignore this field.

```
CONST
     cmFlagsEOM    =      $0001;
```

CMAddSearch

Adding a data stream search

When an application is reading data with `CMRead`, you can have the data stream searched for one or more patterns of bytes. To perform the search, your application must pass information to the Connection Manager, such as the connection on which the data stream is coming in and the sequences of bytes for which to look. `CMAddSearch` tells the Connection Manager to perform the search, passing it search-specific information as well. Each time your application calls `CMAddSearch`, the Connection Manager searches for an additional sequence of bytes.

Function

```
CMAddSearch(hConn: ConnHandle; theString: Str255; flags:
CMSearchFlags; callBack: ProcPtr): LONGINT;
```

Description

The value `CMAddSearch` returns is a search reference number that is used by the `CMRemoveSearch` routine (described later in this section). If `CMAddSearch` returns –1, the connection tool did not successfully add the search. Your application uses the search reference number to distinguish among different searches that may be occurring simultaneously on the same connection.

`flags` is a field that describes the search to be performed. The appropriate values are as follows:

```
TYPE
     CMSearchFlags        =      INTEGER;

CONST
     cmSearchSevenBit     =      $0001;
```

If `cmSearchSevenBit` is on, the Connection Manager matches only the low 7 bits of a character; otherwise, it matches all 8 bits. The other bits of `flags` are reserved for Apple Computer

`callBack` is a pointer to a routine the Connection Manager will call during `CMRead` in the event that the connection tool finds a match. The calling conventions for the call-back procedure are given in the next section.

`MySearchCallBack`

What to do when there's a match

The Connection Manager will pass control to a search call-back procedure in the event that the connection tool finds a match in the incoming data stream. This routine may be called at interrupt level.

Procedure

```
MySearchCallBack(hConn: ConnHandle; matchPtr: Ptr; refNum:
LONGINT);
```

Description `matchPtr` points to the last matched character in the read buffer.

`MySearchCallBack` uses the search reference number `CMAddSearch` returns; your application should pass this value in `refNum`.

◆ *Note:* The Connection Manager calls `MySearchCallBack` when a read completes, and therefore might be called at interrupt level. If your application makes asynchronous calls, `MySearchCallBack` has the same restrictions as the standard Device Manager completion routines.

`CMRemoveSearch`

Stopping a data stream search

`CMRemoveSearch` removes the search with the specified reference number for the specified connection record. This routine can not be called at interrupt level (making it impossible for `MySearchCallBack` to call this routine).

Procedure

```
CMRemoveSearch(hConn: ConnHandle; refNum: LONGINT);
```

Description `refnum` is the search reference number returned by `CMAddSearch`.

`CMClearSearch`

Clearing all data stream searches

`CMClearSearch` removes all searches associated with the specified connection record.

Procedure

```
CMClearSearch(hConn: ConnHandle);
```

Description `CMClearSearch` cannot be called from interrupt level.

Handling events

The Connection Manager event-processing routines provide useful extensions to the Macintosh Toolbox Event Manager. This section explains the four routines the Connection Manager provides. See "Other Events" in Chapter 2 for sample code showing how an application can determine if an event needs to be handled by one of these routines.

`CMActivate`

Activate events

`CMActivate` processes an activate or deactivate event (for instance, installing or removing a custom tool menu) for a window associated with the connection.

Procedure

```
CMActivate(hConn: ConnHandle; activate: BOOLEAN);
```

Description If `activate` is `TRUE`, the connection tool processes the activate event. Otherwise, it processes a deactivate event.

`CMResume`

Resume events

`CMResume` processes a resume or suspend event for a window associated with the connection.

Procedure

```
CMResume(hConn: ConnHandle; resume: BOOLEAN);
```

Description If `resume` is `TRUE`, the connection tool processes a resume event. Otherwise, it processes a suspend event.

`CMMenu`

Menu events

Your application must call `CMMenu` when the user chooses an item from a menu that is installed by the connection tool.

Function

```
CMMenu(hConn: ConnHandle; menuID: INTEGER; item: INTEGER):
BOOLEAN;
```

Description `CMMenu` returns `FALSE` if the connection tool did not handle the menu event. `CMMenu` returns `TRUE` if the connection tool did handle the menu event.

Other events

When your application receives an event, it should check if the `refcon` of the window is a tool's `ConnHandle`. Such an event occurs, for example, when the user clicks a button in a dialog box displayed by the connection tool. If it does belong to a connection tool's window, your application can call `CMEvent`.

Procedure `CMEvent(hConn: ConnHandle; theEvent: EventRecord);`

Description A window (or dialog box) created by a connection tool has a connection record handle stored in the `refCon` field for `windowRecord`.

Localizing configuration strings

The Communications Toolbox provides two routines that make it easier to localize configuration strings.

`CMIntlToEnglish`

Translating into English

`CMIntlToEnglish` converts a configuration string, which is pointed to by `inputPtr`, to an American English configuration string pointed to by `outputPtr`.

Function

```
CMIntlToEnglish(hConn: ConnHandle; inputPtr: Ptr; VAR
outputPtr: Ptr; language: INTEGER): OSErr;
```

Description

The function returns an operating-system error code if any internal errors occur.

The connection tool allocates space for `outputPtr`. Your application is responsible for disposing of the pointer with `DisposPtr` when done with it.

`language` specifies the language from which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, this routine returns `cmNoErr`, but `outputPtr` is `NIL`.

`CMEnglishToIntl`

Translating from English

`CMEnglishToIntl` converts an American English configuration string, which is pointed to by `inputPtr`, to a configuration string pointed to by `outputPtr`.

Function

```
CMEnglishToIntl(hConn: ConnHandle; inputPtr: Ptr; VAR
outputPtr: Ptr; language: INTEGER): OSErr;
```

Description

The function returns an operating-system error code if any internal errors occur.

The connection tool allocates space for `outputPtr`; your application is responsible for disposing of the pointer with `DisposPtr` when done with it.

`language` specifies the language to which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, `cmNoErr` is still returned, but `outputPtr` is `NIL`.

Miscellaneous routines

The routines described in this section perform a variety of tasks.

CMGetToolName

Getting the name of a tool

`CMGetToolName` returns in `name` the name of the tool specified by `procID`.

Procedure `CMGetToolName(procID: INTEGER; VAR name: Str255);`

Description If `procID` references a connection tool that does not exist, the Connection Manager sets `name` to an empty string.

CMSetRefCon

Setting the connection record's reference constant

`CMSetRefCon` sets the connection record's `refCon` field to the specified value. It is very important that your application use this routine to change the value of the reference constant, instead of changing it directly.

Procedure `CMSetRefCon(hConn: ConnHandle; refCon : LONGINT);`

CMGetRefCon

Getting the connection record's reference constant

`CMGetRefCon` returns the connection record's reference constant.

Function `CMGetRefCon(hConn: ConnHandle): LONGINT;`

CMSetUserData

Setting the `userData` field

`CMSetUserData` sets the connection record's `userData` field to the specified value. It is very important that your application use this routine to change the value of the `userData` field, instead of changing it directly.

Procedure

```
CMSetUserData(hConn: ConnHandle; userData: LONGINT);
```

CMGetUserData

Getting the `userData` field

`CMGetUserData` returns the connection record's `userData` field.

Function

```
CMGetUserData(hConn: ConnHandle): LONGINT;
```

CMGetVersion

Getting `'vers'` resource information

`CMGetVersion` returns a handle to a relocatable block, which contains the information in the connection tool's `'vers'` resource with ID=1. Your application is responsible for disposing of the handle when done with it.

◆ *Note:* The handle returned is *not* a resource handle.

Function

```
CMGetVersion(hConn:ConnHandle): Handle;
```

CMGetCMVersion

Getting the Connection Manager version number

`CMGetCMVersion` returns the version number of the Connection Manager.

Function

```
CMGetCMVersion: INTEGER;
```

Description

The version number of the Connection Manager described in this document is:

```
CONST
     curCMVersion =      1;
```

Completion routines

This section describes the syntax and conventions that apply to completion routines in your application.

`MyCompletion`

Writing a completion routine

The completion routine has the same restrictions as do standard Device Manager completion routines. For example, your routine should not allocate memory.

Procedure

```
MyCompletion(hConn:  ConnHandle);
```

Description When the Connection Manager calls `MyCompletion`, the `errCode` field of the connection record contains the appropriate error code. The `asyncCount` field of the connection record contains the actual number of bytes read or written. Because the `errCode` field of the connection record is used by all of the Connection Manager routines, it contains the error code for the asynchronous operation only during execution of `MyCompletion`.

Quick reference

This section provides a reference to Connection Manager routines and data structures. At the end of this section is a listing of routine selectors for programming in assembly language.

Routines

Connection Manager routines	*See page*
`CMAbort(hConn: ConnHandle): CMErr;`	*49*
`CMAccept(hConn:ConnHandle; accept:BOOLEAN): CMErr;`	*52*
`CMActivate(hConn: ConnHandle; activate: BOOLEAN);`	*61*
`CMAddSearch(hConn: ConnHandle; theString: Str255; flags: CMSearchFlags; callBack: ProcPtr): LONGINT;`	*59*
`CMBreak(hConn: ConnHandle; duration: LONGINT; async: BOOLEAN; completor: ProcPtr);`	*53*
`CMChoose(VAR hConn:ConnHandle; where: Point; idleProc:ProcPtr): INTEGER;`	*41*
`CMClearSearch(hConn: ConnHandle);`	*60*
`CMClose(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr; timeout: LONGINT; now: BOOLEAN): CMErr;`	*49*
`CMDefault(VAR theConfig: Ptr; procID: INTEGER; allocate: BOOLEAN);`	*40*
`CMDispose(hConn: ConnHandle);`	*50*
`CMEnglishToIntl(hConn: ConnHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*63*
`CMEvent(hConn: ConnHandle; theEvent: EventRecord);`	*62*
`CMGetCMVersion: INTEGER;`	*65*
`CMGetConfig(hConn: ConnHandle): Ptr;`	*47*
`CMGetConnEnvirons (hConn : ConnHandle; VAR theEnvirons : ConnEnvironRec) : CMErr;`	*54*
`CMGetToolName(procID: INTEGER; VAR name: Str255);`	*64*
`CMGetProcID(name: Str255): INTEGER;`	*37*
`CMGetRefCon(hConn: ConnHandle): LONGINT;`	*64*
`CMGetUserData(hConn: ConnHandle): LONGINT;`	*65*
`CMGetVersion(hConn:ConnHandle):Handle;`	*65*
`CMIdle(hConn: ConnHandle);`	*50*
`CMIntlToEnglish(hConn: ConnHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*63*

Connection Manager routines	*See page*
`CMIOKill(hConn: ConnHandle; which: INTEGER): CMErr;`	*52*
`CMListen(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr; timeout: LONGINT): CMErr;`	*50*
`CMMenu(hConn: ConnHandle; menuID: INTEGER; item: INTEGER): BOOLEAN;`	*61*
`CMNew(procID : INTEGER; flags : CMRecFlags; desiredSizes : CMBufferSizes; refCon : LONGINT; userData : LONGINT) : ConnHandle;`	*38*
`CMOpen(hConn: ConnHandle; async: BOOLEAN; completor: ProcPtr; timeout: LONGINT): CMErr;`	*48*
`CMRead(hConn: ConnHandle; theBuffer: Ptr; VAR toRead: LONGINT; theChannel: CMChannel; async: BOOLEAN; completor: ProcPtr; timeout: LONGINT; VAR flags: CMFlags): CMErr;`	*56*
`CMRemoveSearch(hConn: ConnHandle; refNum: LONGINT);`	*60*
`CMReset(hConn: ConnHandle);`	*53*
`CMResume(hConn: ConnHandle; resume: BOOLEAN);`	*61*
`CMSetConfig(hConn: ConnHandle; thePtr: Ptr): INTEGER;`	*47*
`CMSetRefCon(hConn: ConnHandle; refCon: LONGINT);`	*64*
`CMSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*45*
`CMSetupFilter(procID: INTEGER; theConfig: Ptr; count:INTEGER; theDialog: DialogPtr; VAR theEvent: EventRecord; VAR theItem: INTEGER; VAR magicCookie: LONGINT): BOOLEAN;`	*44*
`CMSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie: LONGINT);`	*45*
`CMSetupPostflight(procID:INTEGER);`	*46*
`CMSetupPreflight(procID: INTEGER; VAR magicCookie: LONGINT): Handle;`	*43*
`CMSetupSetup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*44*
`CMSetUserData(hConn: ConnHandle; userData: LONGINT);`	*65*
`CMStatus(hConn: ConnHandle; VAR sizes: CMBufferSizes; VAR flags: CMStatFlags): CMErr;`	*51*
`CMValidate(hConn: ConnHandle): BOOLEAN;`	*40*

Connection Manager routines	***See page***
`CMWrite(hConn: ConnHandle; theBuffer: Ptr; VAR toWrite: LONGINT; theChannel: CMChannel; async: BOOLEAN; completor: ProcPtr; timeout: LONGINT; flags: CMFlags): CMErr;`	*58*
`InitCM  :  CMErr;`	*36*

Routines in your application	***See page***
`MySearchCallBack(hConn: ConnHandle; matchPtr: Ptr; refNum: LONGINT);`	*60*
`MyCompletion(hConn: ConnHandle);`	*66*

Connection Record

```
TYPE
        ConnHandle          =       ^ConnPtr;
        ConnPtr             =       ^ConnRecord;
        ConnRecord          =       RECORD
                procID      :       INTEGER;

                flags       :       CMRecFlags;
                errCode     :       CMErr;

                refCon      :       LONGINT;
                userData    :       LONGINT

                defProc     :       ProcPtr;

                config      :       Ptr;
                oldConfig   :       Ptr;

                reserved0   :       LONGINT;
                reserved1   :       LONGINT;
                reserved2   :       LONGINT;

                cmPrivate   :       Ptr;

                bufferArray :       CMBuffers;
                bufSizes    :       CMBufferSizes;

                mluField    :       LONGINT;

                asyncCount  :       CMBufferSizes;

        END;
```

Constants and data types

```
TYPE
       CMBufFields=(
              cmDataIn,
              cmDataOut
              cmCntlIn
              cmCntlOut
              cmAttnIn
              cmAttnOut
              cmRsrvIn
              cmRsrvOut);

       CMBuffers            =      ARRAY[CMBufFields]  OF  Ptr;
       CMBufferSizes        =      ARRAY[CMBufFields]  OF  LONGINT;
```

Connection Environment Record

```
TYPE
       ConnEnvironRecPtr      :       ^ConnEnvironRec;
       ConnEnvironRec         :       RECORD;
              version         :       INTEGER;
              baudRate        :       LONGINT;
              dataBits        :       INTEGER;
              channels        :       CMChannel;
              swFlowControl   :       BOOLEAN;
              hwFlowControl   :       BOOLEAN;
              flags           :       CMFlags;
       END;
```

```
TYPE
       CMFlags       =      INTEGER;

CONST
       cmFlagsEOM    =      1;


TYPE
       CMChannel:  INTEGER;
```

```
CONST
       cmData        =       $00000001;
       cmCntl        =       $00000002;
       cmAttn        =       $00000004;

       cmDataClean   =       $00000100;
       cmCntlClean   =       $00000200;
       cmAttnClean   =       $00000400;

       cmNoMenus     =       $00010000;
       cmQuiet       =       $00020000;
```

Version constants

```
CONST
       curConnEnvRecVers   =     0;

       curCMVersion        =     1;
```

Connection record flags bit masks

```
TYPE
       CMRecFlags    =       LONGINT;

CONST
       cmData        =       $00000001;
       cmCntl        =       $00000002;
       cmAttn        =       $00000004;

       cmDataClean   =       $00000100;
       cmCntlClean   =       $00000200;
       cmAttnClean   =       $00000400;

       cmNoMenus     =       $00010000;
       cmQuiet       =       $00020000;
```

Search flags

```
TYPE
       CMSearchFlags       =     INTEGER;

CONST
       cmSearchSevenBit    =     $0001;
```

Values returned by CMChoose

```
CONST
       chooseDisaster     =   -2;
       chooseFailed       =   -1;
       chooseAborted      =    0;
       chooseOKMinor      =    1;
       chooseOKMajor      =    2;
       chooseCancel       =    3;
```

Connection status flags

```
TYPE
       CMStatFlags                  = LONGINT;

CONST
       cmStatusOpening              = $00000001; {tool is opening connection}
       cmStatusOpen                 = $00000002; {connection is open}
       cmStatusClosing              = $00000004; {tool is closing connection}
       cmStatusDataAvail            = $00000008; {data present on data channel}
       cmStatusCntlAvail            = $00000010; {data present on cntl channel}
       cmStatusAttnAvail            = $00000020; {data present on attn channel}

       cmStatusDRPend               = $00000040; {data read pending}
       cmStatusDWPend               = $00000080; {data write pending}
       cmStatusCRPend               = $00000100; {cntl read pending}
       cmStatusCWPend               = $00000200; {cntl write pending}
       cmStatusARPend               = $00000400; {attn read pending}
       cmStatusAWPend               = $00000800; {attn write pending}

       cmStatusBreakPending         = $00001000; {tool is breaking the connection}
       cmStatusListenPend           = $00002000; {tool is "listening" for data}
       cmStatusIncomingCallPresent = $00004000; {call waiting for tool to handle}
```

Errors

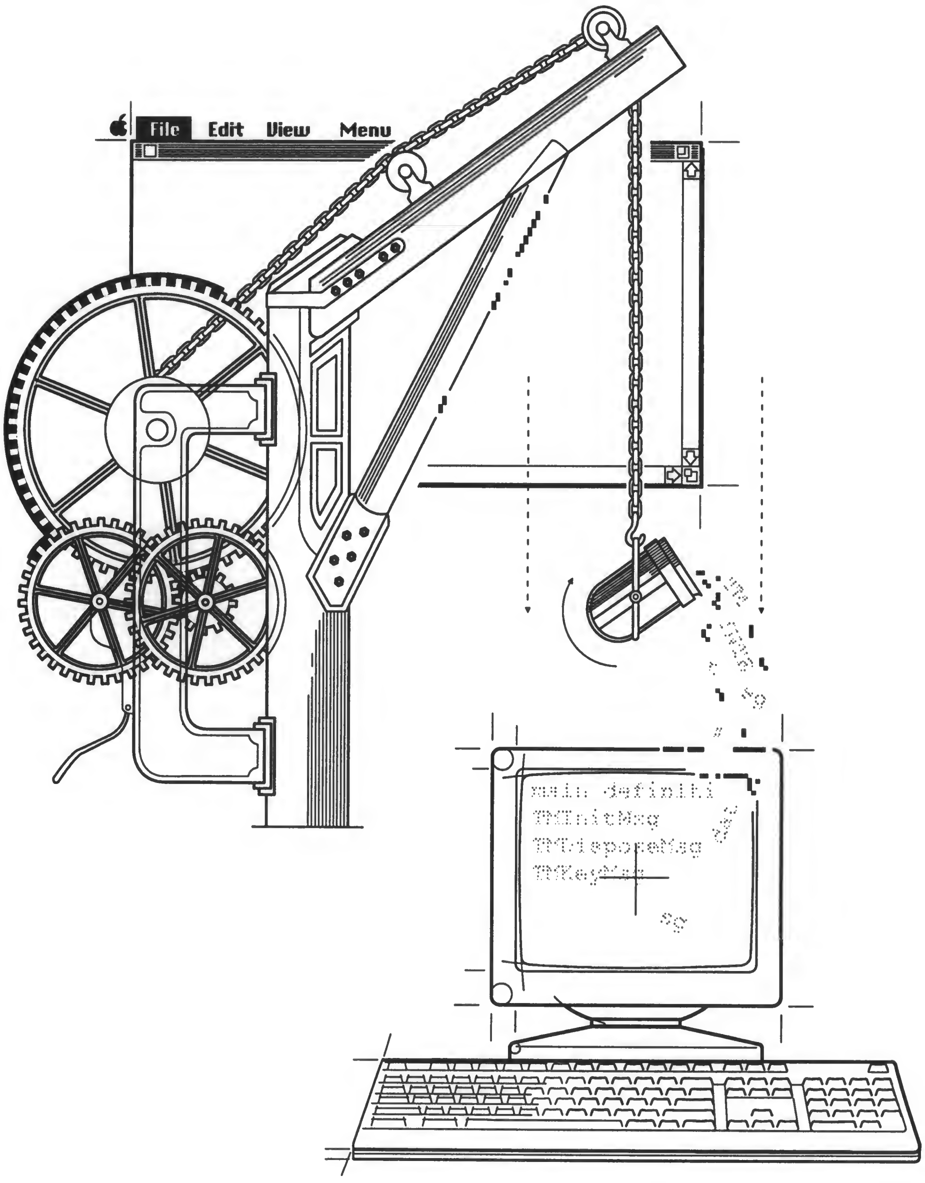
```
TYPE
       CMErr              =     OSErr;

CONST
       cmGenericError     =   -1;
       cmNoErr            =    0;
       cmRejected         =    1;
       cmFailed           =    2;
       cmTimeOut          =    3;
       cmNotOpen          =    4;
       cmNotClosed        =    5;
       cmNoRequestPending =    6;
       cmNotSupported     =    7;
       cmNoTools          =    8;
```

Connection Manager routine selectors

◆ *Assembly note:* The Communications Toolbox routines are accessed via a Macintosh Operating System trap. `A0` contains a pointer to the routine parameters. You can call each of the Communications Tooolbox routines with a macro that has the same name as the routine preceded by an underscore. When expanded, these macros put the routine selector onto the stack, set `A0` to point to the selector, invoke the trap macro `_ComToolTrap ($A08B)`, and finally pop the routine selector back off the stack. It is your application's responsibility to remove the parameters.

CMAbort	.EQU	271
CMAccept	.EQU	269
CMActivate	.EQU	275
CMAddSearch	.EQU	294
CMBreak	.EQU	293
CMChoose	.EQU	292
CMClearSearch	.EQU	296
CMClose	.EQU	270
CMDefault	.EQU	280
CMDispose	.EQU	265
CMEnglishToIntl	.EQU	287
CMEvent	.EQU	298
CMGetCMVersion	.EQU	289
CMGetConfig	.EQU	284
CMGetConnEnvirons	.EQU	300
CMGetProcID	.EQU	263
CMGetRefCon	.EQU	259
CMGetToolName	.EQU	262
CMGetUserData	.EQU	261
CMGetVersion	.EQU	288
CMIdle	.EQU	266
CMIntlToEnglish	.EQU	286
CMIOKill	.EQU	297
CMListen	.EQU	268
CMMenu	.EQU	277
CMNew	.EQU	264
CMOpen	.EQU	267
CMRead	.EQU	273
CMRemoveSearch	.EQU	295
CMReset	.EQU	278
CMResume	.EQU	276
CMSetConfig	.EQU	285
CMSetRefCon	.EQU	258
CMSetupCleanup	.EQU	283
CMSetupFilter	.EQU	290
CMSetupItem	.EQU	282
CMSetupPostflight	.EQU	299
CMSetupPreflight	.EQU	291
CMSetupSetup	.EQU	281
CMSetUserData	.EQU	260
CMStatus	.EQU	272
CMValidate	.EQU	279
CMWrite	.EQU	274
InitCM	.EQU	257

Chapter 4 **Terminal Manager**



THIS CHAPTER describes the Terminal Manager, the Communications Toolbox manager that allows applications to perform terminal emulation independent of a specific type of terminal. This chapter starts out by describing fundamental concepts about the Terminal Manager. It goes on to describe the **terminal emulation window** and the data structure most important to the Terminal Manager, the **terminal record.** Next, this chapter presents a detailed functional description of each routine provided by the Terminal Manager. It then describes the routines that need to be in your application. At the end of the chapter, you'll find a quick reference to routines, data structures, and routine selectors for programming in assembly language.

In this chapter, the term *your application* refers to the application you are writing for the Macintosh, which will implement communications services for users. Be careful not to confuse the services your application provides with the services that tools provide.

To use **terminal tools** in an application, you need to be familiar with

- the Resource Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the QuickDraw™ (described in *Inside Macintosh,* Volumes I, V)
- the Event Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the Scrap Manager (described in *Inside Macintosh,* Volume I)
- the Dialog Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the Connection Manager (described in Chapter 3 of this document)

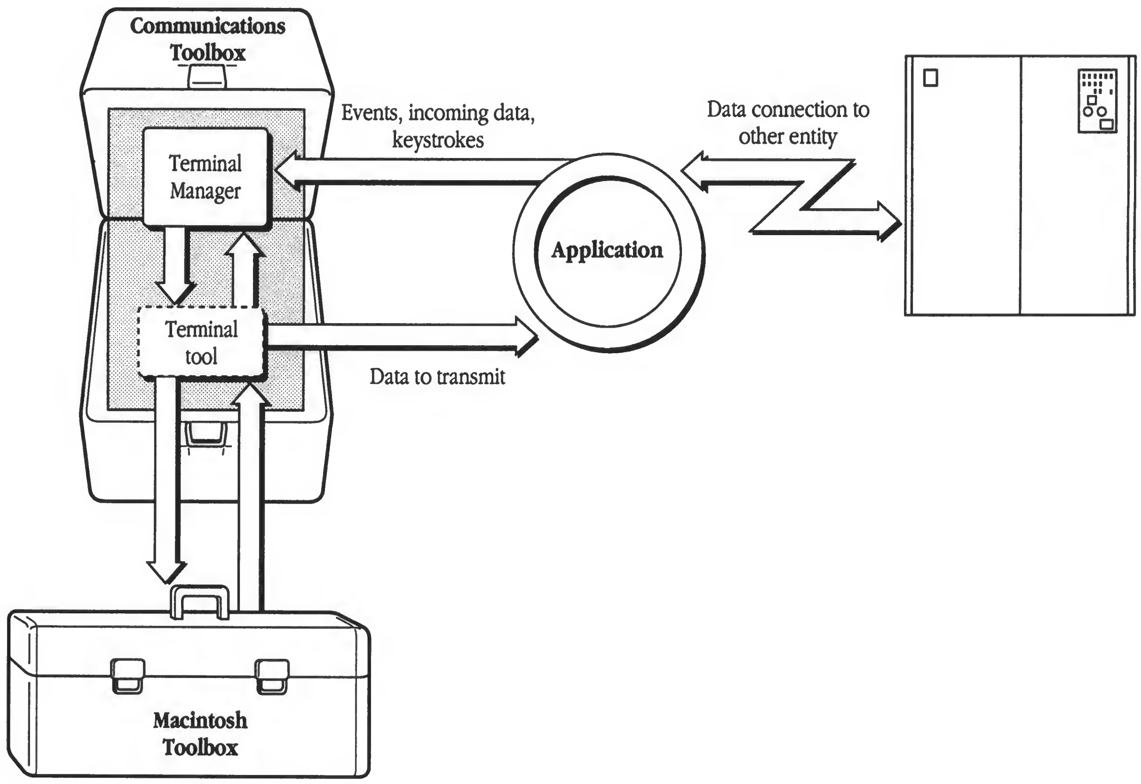
About the Terminal Manager

By using Terminal Manager routines, your application can implement a terminal emulation without having to take into account the characteristics of any one type of terminal. Terminal tools, which are discussed in Chapter 10, are responsible for implementing the characteristics of specific terminal types.

The Terminal Manager provides a generic terminal emulation that is best described with an example. Suppose your application needs to tell a mainframe at the other end of an existing data connection that the user has typed the letter *a*. Your application detects that the user has pressed a key, and passes this event on to the Terminal Manager by calling the `TMKey routine`. The Terminal Manager passes this event on to a previously selected terminal tool. The terminal tool figures out the appropriate value to transmit for *a* and sends it out on the data connection. This example, of course, is a very simple one. But it is meant to give you a general feel for what goes on inside the Terminal Manager. The rest of this chapter goes into much more detail.

Figure 4-1 shows the data flow into and out of the Terminal Manager.

■ **Figure 4-1** Data flow into and out of the Terminal Manager



The most important data structure maintained by the Terminal Manager is the terminal record, which is where all the specifics of a terminal emulation are stored. For example, the terminal record might show that your application is emulating a VT320™ terminal, and that the Terminal Manager should try to cache the terminal window before clearing it.

One important aspect of the terminal record is that it allows you to write routines independent of specific terminal characteristics. For instance, when an application wants to transmit a keystroke to a host computer, it tells the Terminal Manager to transmit the keystroke, and the terminal tool figures out exactly how to transmit the keystroke for a specific type of terminal.

Another important aspect of the terminal record is that it allows for multiple instances of the same tool. This means that the same tool can be used by different processes at the same time, as in a MultiFinder environment, or by different threads in a given application. The terminal record is described in greater detail later in this chapter.

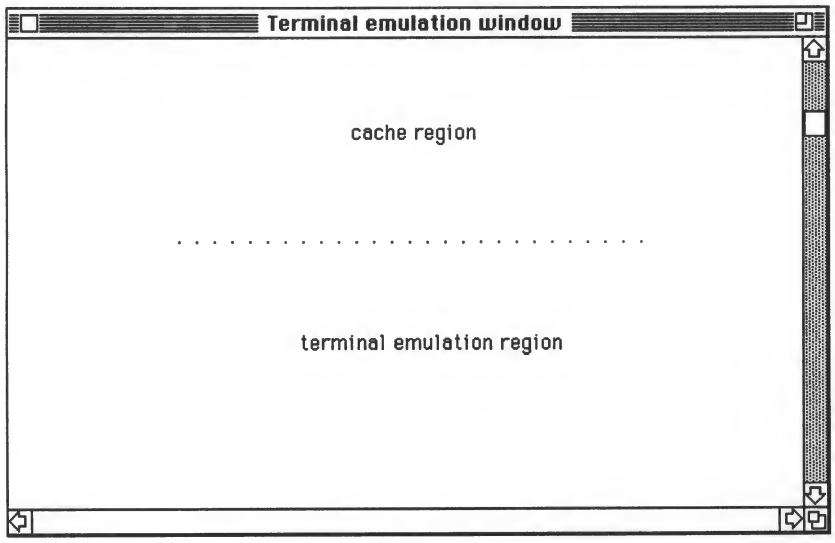
Besides providing access to basic terminal emulation services, the Terminal Manager includes routines that make it easy for your application to configure a terminal tool, either by presenting the user with a dialog box or by interfacing directly with a scripting language. The Terminal Manager also contains routines that make it easier for you to localize your applications in other languages.

You can use the Terminal Manager in conjunction with other Communications Toolbox managers to create a communications application with basic connection, terminal emulation, and file transfer capabilities. Or, you can use the Terminal Manager with some other connection service or file transfer service instead of the Connection Manager and File Transfer Manager. You can also write your own terminal tool for the Terminal Manager to use (this procedure is discussed in Chapters 8 and 10). Regardless of which method you choose, your application should be able to handle different terminal tools such that users can change tools and still be able to use your program.

The terminal emulation window

The Terminal Manager provides terminal tools with a terminal emulation window. In addition to title bar, scroll bars, and other standard user interface elements, the terminal emulation window has two major parts: the **terminal emulation region** and the **cache region.** *Figure 4-2* shows these parts.

■ **Figure 4-2** A terminal emulation window



The terminal emulation region

The terminal emulation region is the area of the terminal window in which the terminal tool displays data in a manner that emulates a specific terminal. Terminal tools use a **terminal emulation buffer** to store the data displayed in the terminal emulation region. Your application and the terminal tools exchange this data through a `TermDataBlock`, which is an extensible data structure that handles text and graphics information. For text terminals, the `TermDataBlock` describes a line of text in the terminal emulation region. For graphics terminals, the `TermDataBlock` describes a picture in the terminal emulation region. The format of `TermDataBlock` is as follows:

```
TYPE
      TermDataBlockH       =       ^TermDataPtr;
      TermDataBlockPtr     =       ^TermDataBlock;
      TermDataBlock        =       RECORD
            flags          :       TMTermTypes;
            theData        :       Handle;
            auxData        :       Handle;
            reserved       :       LONGINT;
      END;
```

`flags` describes the data in the `TermDataBlock`. Valid values are: `TMTextTerminal` and `TMGraphicsTerminal`.

`theData` is a handle to data, which is text characters for text terminals and a QuickDraw picture for graphics terminals. Your application can get the size of `theData` by calling `GetHandleSize(theData)`.

`auxData` and `reserved` are reserved by Apple Computer Do not use them or your application may not work in the future.

The cache region

The cache region is an optional area in the window, which your application can use to display data that scrolls off the top of the terminal emulation region. Because terminal tools do not maintain this area of the terminal emulation window, your application must provide all the necessary code if you want a cache region.

The terminal record

The terminal record contains information that describes a terminal emulation, as well as pointers to Terminal Manager internal data structures. The Terminal Manager uses this information to "translate" the protocol-independent routines used by an application or tool into a service implemented according to a specified terminal emulation. Most of the fields in the terminal record are filled in when an application calls `TMNew`, described later in this chapter.

Because the context for a given terminal emulation is maintained in a terminal record, an application can maintain more than one terminal emulation at the same time. All the application has to do is create a new terminal record every time it initiates a terminal emulation.

△ **Important** Your application, in order to be compatible with future releases of the Terminal Manager, should not directly manipulate the fields of the terminal record (with the exception of `config` and `oldConfig`). The Terminal Manager provides routines that applications and tools can use to change terminal record fields. These routines are discussed later in this chapter. △

Terminal record data structure

```
TYPE
       TermHandle       =       ^TermPointer;
       TermPointer      =       ^TermRecord;
       TermRecord       =       RECORD
              procID    =       INTEGER


              flags     :       TMFlags;
              errCode   :       TMErr;

              refCon    :       LONGINT;
              userData  :       LONGINT;

              defProc   :       ProcPtr;

              config    :       Ptr;
              oldConfig :       Ptr;

              environsProc :    ProcPtr;
              reserved1    :    LONGINT;
              reserved2    :    LONGINT;
```

```
            tmPrivate     :      Ptr;

            sendProc      :      ProcPtr;
            breakProc     :      ProcPtr;
            cacheProc     :      ProcPtr;
            clikLoop      :      ProcPtr;


            owner         :      WindowPtr;
            termRect      :      Rect;
            viewRect      :      Rect;
            visRect       :      Rect;

            lastIdle      :      LONGINT;

            selection     :      TMSelection;
            selType       :      TMSelTypes;

            mluField      :      LONGINT;
        END;
```

procID

`procID` is the terminal tool `ID`. This value is dynamically assigned by the Terminal Manager when your application calls `TMGetProcID`.

flags

`flags` is a bit field with the following masks:

```
CONST
       tmInvisible          =      $00000001;
       tmSaveBeforeClear    =      $00000002;
       tmNoMenus            =      $00000004;
       tmAutoScroll         =      $00000008;

TYPE
       TMFlags              :      LONGINT;
```

If your application sets `tmInvisible`, the Terminal Manager maintains a terminal emulation but does not display it. Your application can use the terminal emulation and cache region to create some other presentation service, instead of a terminal emulation.

If your application sets `tmSaveBeforeClear`, the terminal tool will try to cache the entire terminal emulation region in response to any clear-screen operation. Clear-screen operations are generated from a user's request, a clear-screen character sequence, or a terminal-reset character sequence.

If your application sets `tmNoMenus`, the terminal tool will not put up any custom menus.

If your application sets `tmAutoScroll`, the terminal tool will automatically scroll the terminal emulation window (if necessary) while the user is highlighting a selection.

errCode

The Terminal Manager does not use `errCode`; it is included in this version (version 1.0) of the terminal record for reasons of historical preservation. Your application must not use this field.

refCon

`refCon` is a `LONGINT` that your application can use.

userData

`userData` is a `LONGINT` that your application can use.

defProc

`defProc` is a pointer to the main code resource of the terminal tool that will implement the specifics of the terminal emulation. The terminal tool's main code resource is of type `'tdef'`.

config

`config` is a pointer to a data block that is private to the terminal tool.

Your application can store the contents of `config` to save the state of a terminal in a document. The structure, size, and contents of the configuration record are set by the tool. Your application can determine the size of the configuration record by calling `GetPtrSize`, overwrite its contents using `BlockMove`, and validate the contents with `TMValidate`.

Your application can use `TMGetConfig` and `TMSetConfig` to manipulate fields in this record. For details, read "Interfacing with a Scripting Language," later in this chapter.
You can find a description of `config` from a terminal tool perspective in Chapter 8.

oldConfig

`oldConfig` is a pointer to a data block that is private to the terminal tool and contains the most recently saved version of `config`. Your application is responsible for setting `oldConfig` when the user saves a session document.

environsProc

`environsProc` is a pointer to a routine in your application that the terminal tool can call to obtain a record describing the connection environment. A more detailed description of `environsProc` appears later in this chapter in "Routines That Must Be in Your Application."

reserved1 and **reserved2**

`reserved1` and `reserved2` are reserved for the Terminal Manager. Your application must not use this field.

`tmPrivate`

`tmPrivate` is a pointer to a data block that is private to the terminal tool. Your application must not use this field.

`sendProc`

`sendProc` is a pointer to a routine your application calls when it needs to send data to another application. A more detailed description of `sendProc` appears later in this chapter in "Routines That Must Be in Your Application."

`breakProc`

`breakProc` is a pointer to a routine in your application that performs a break operation. The effect the break has depends on the terminal emulation being used. A more detailed description of `breakProc` appears later in this chapter in "Routines That Must Be in Your Application."

`cacheProc`

`cacheProc` is a pointer to a routine in your application that saves lines that scroll off the top of the terminal emulation region. The terminal tool also uses this routine to save the terminal screen before a clear-screen operation (if the `TMSaveBeforeClear` bit is set in the `flags` field of the terminal record). A more detailed description of `cacheProc` appears later in this chapter in "Routines That Must Be in Your Application."

`clikLoop`

`clikLoop` is a pointer to a routine in your application that handles mouse clicks. The terminal tool calls the click loop repeatedly when the user is clicking or dragging an object. A more detailed description of this routine appears later in this chapter in "Routines That Must Be in Your Application."

`owner`

`owner` is a pointer to the grafPort in which your application displays the terminal emulation.

`termRect`

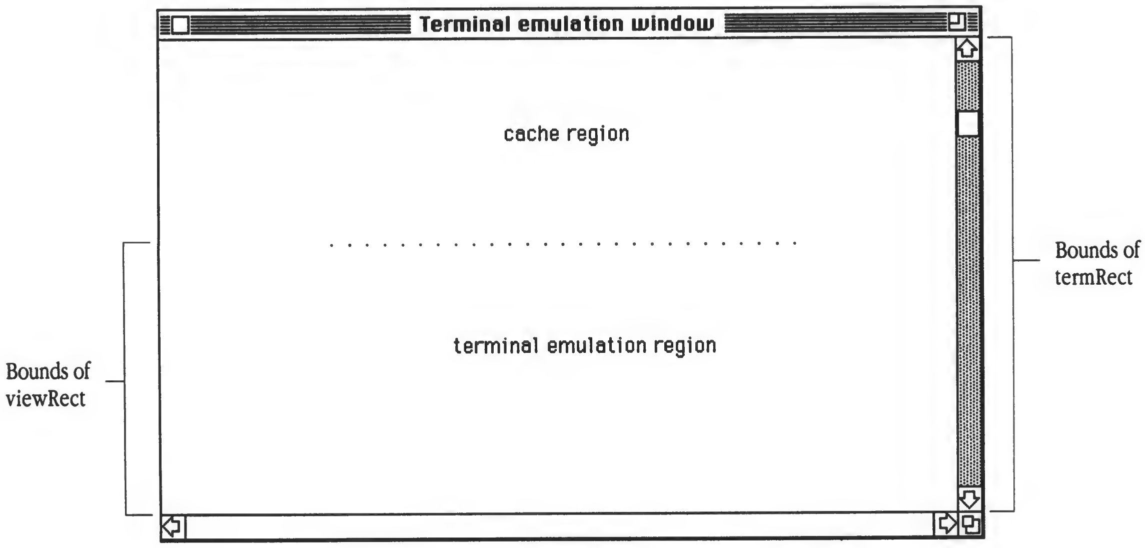
`termRect` is the portRect of the current window, minus the scroll bars. This portRect represents the boundaries of the terminal emulation region. *Figure 4-3* shows how `termRect` relates to the terminal emulation window.

◆ *Note:* Your application can display the terminal emulation region in an area that is smaller than `termRect`, but it must not display the combination of the cache region and terminal emulation region in an area larger than `termRect`.

`viewRect`

`viewRect` is a subset of `termRect`; it represents the boundaries of the visible part of the terminal emulation region. *Figure 4-3* shows how `viewRect` relates to the terminal emulation window.

■ **Figure 4-3** Bounds of `viewRect` and `termRect`



`visRect`

`visRect` is a rectangle that represents the currently visible rows and columns in the terminal emulation region (for text terminals). It has the same dimensions as `viewRect`, but is defined by coordinates that represent rows and column numbers. Numbering of rows and columns begins with the number 1.

`visRect.top` is the top visible line, and `visRect.left` is the leftmost visible column in the terminal emulation region. `visRect.bottom` is the bottom visible line, and `visRect.right` is the rightmost visible column in the terminal region. These values are used by the application to determine scroll-bar values.

`lastIdle`

`lastIdle` is the last time (in ticks) that the idle procedure was called for the specified terminal record.

selection

`selection` is a data structure that describes the extent of the current selection in the terminal emulation window. Since `selection` can describe either a rectangle or a region, it describes the selection in one of two kinds of data structures: a `Rect` or a `RgnHandle`. The format of the `TMSelection` data structure is as follows:

```
TYPE
        TMSelection                =       RECORD
                CASE INTEGER OF
                1:      (
                        selRect        :       Rect;
                        );
                2:      (
                        selRgnHandle :       RgnHandle;
                        filler         :       LONGINT;
                        );
                END;
```

`selRect` is of type `Rect` and describes the rectangle that has been selected. On a text terminal, it contains the row/column pairs, with counting beginning at 1. On a graphics terminal, it contains pixel coordinates, with (1,1) being the `topLeft` corner of the terminal region.

On a graphics terminal, if the selection is a MacPaint®-style lasso, `selection` is a `selRgnHandle` that represents the selection region.

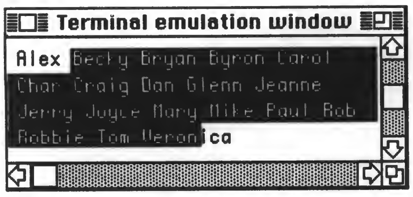
selType

`selType` is a field that further describes a selection; it indicates the highlighting mode that is used to show the selection. Valid values are as follows:

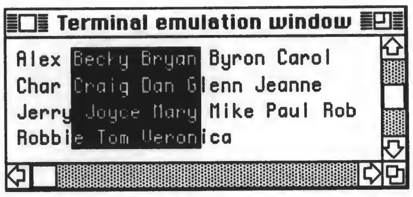
```
CONST
        selTextNormal        =       $0001;
        selTextBoxed         =       $0002;
        selGraphicsMarquee   =       $0004;
        selGraphicsLasso     =       $0008;

TYPE

        TMSelTypes           =       INTEGER;
```

Figure 4-4 and *Figure 4-5* show that even though two selections may have the same coordinates, different values for `selType` yield different highlighting results. *Figure 4-4* shows the text-selection mode `selTextNormal`. *Figure 4-5* shows a text selection in `selTextBoxed` mode.

■ **Figure 4-4** The text selection mode `selTextNormal`


Terminal emulation window
Alex Becky Bryan Byron Carol
Char Craig Dan Glenn Jeanne
Jerry Joyce Mary Mike Paul Rob
Robbie Tom Veronica

■ **Figure 4-5** The text selection mode `selTextBoxed`


Terminal emulation window
Alex Becky Bryan Byron Carol
Char Craig Dan Glenn Jeanne
Jerry Joyce Mary Mike Paul Rob
Robbie Tom Veronica

`selGraphicsMarquee` is a standard rectangular MacPaint-style marquee. `selGraphicsLasso` is a standard MacPaint-style lasso. Your application uses these types of highlighting with graphics terminals.

`mluField`

`mluField` is a `LONGINT` that terminal tools use. Your application does not need to be concerned with this field.

Terminal Manager routines

The sections describe the routines that tools and applications can use to access Terminal Manager services. Your application can not call these routines from interrupt level.

Below is a listing of the routines described in this section in the order in which they are presented.

Preparing for a terminal emulation

Before your application can start a terminal emulation, it must initialize the Terminal Manager (by calling `InitTM`), find out the `procID` of the tool it requires (by calling `TMGetProcID`), create a terminal record (by calling `TMNew`), and then configure the terminal tool (by restoring `config` from a saved document; or by calling `TMChoose`, the terminal tool custom configuration routines, or `TMSetConfig`).

`InitTM`

Initializing the Terminal Manager

`InitTM` initializes the Terminal Manager. Your application should call this routine after it calls the standard Macintosh Toolbox initialization routines.

▲ **Warning** Your application must initialize the Communications Resource Manager (by calling `InitCRM`) and then the Communications Toolbox Utilities (by calling `InitCTBUtilities`), whether or not it uses any of their calls, before it initializes the Terminal Manager. ▲

Function

```
InitTM: TMErr;
```

Description

`InitTM` returns an operating-system error code if appropriate. Valid values are:

```
TYPE
     TMErr          =      OSErr;

CONST
     tmGenericError     =     -1;
     tmNoErr            =      0;
     tmNoTools          =      8;
```

Your application must check for the presence of the Communications Toolbox before calling this function. Sample code under "Determining Whether the Managers are Installed" in Appendix B shows you how your application can make this check.

`TMGetProcID`

Getting current `procID` information

Your application should call `TMGetProcID` just before creating a new terminal record, to find out the `procID` of a tool.

Function

```
TMGetProcID(name: Str255): INTEGER;
```

Description

`name` specifies a terminal tool. If there is a terminal tool in the folder named *Communications Folder* with the specified `name`, its `procID` is returned. If `name` references a nonexistent terminal tool, –1 is returned.

Creating a terminal record

Once the Terminal Manager has been initialized, your application needs to call `TMNew` to create a terminal record to describe the terminal emulation that is to take place. `TMNew` creates a new terminal record; fills in the fields it can, based on the parameters that were passed to it; and returns a handle to the new record in `TermHandle`. `TMNew` automatically makes two calls to `TMDefault` (which is described later in this chapter) to fill in `config` and `oldConfig`. The Terminal Manager then loads the terminal tool's main definition procedure, moves it high in the current heap, and locks it. If an error occurs that prevents a new terminal record from being created (for example, running out of memory), `TMNew` passes back `NIL` in `TermHandle`.

Your application must set the current port to the terminal window before it calls `TMNew`.

Function

```
TMNew(termRect: Rect; viewRect: Rect; flags: TMFlags; procID:
INTEGER; owner: WindowPtr; sendProc: ProcPtr; cacheProc:
ProcPtr; breakProc: ProcPtr; clikLoop: ProcPtr; environsProc:
ProcPtr; refCon: LONGINT; userData: LONGINT): TermHandle;
```

Description

`termRect` is a rectangle in local coordinates that represents the boundaries of the terminal emulation region. Your application initially sets this value by passing it as a parameter to `TMNew`.

`viewRect` is a subset of `termRect`, which the terminal tool can actually write into. Your application initially sets this value by passing it as a parameter to `TMNew`, but the terminal tool may resize it.

`flags` is a bit field with the following masks:

```
CONST
     tmInvisible          =      $00000001;
     tmSaveBeforeClear    =      $00000002;
     tmNoMenus            =      $00000004;
     tmAutoScroll         =      $00000008;
```

`flags` represents a request from your application for a level of service.

Apple Computer has reserved the bits of `flags` that are not shown in this document. Do not use them, or your code may not work in the future.

If your application sets `tmInvisible`, the Terminal Manager maintains a terminal emulation but does not display it. Your application can use the terminal emulation and cache regions to create some other presentation service instead of a terminal emulation.

If your application sets `tmSaveBeforeClear`, the terminal tool attempts to cache the entire terminal emulation region in response to any clear-screen operation. Clear-screen operations are generated from either a user's request, a clear-screen character sequence, or a terminal-reset character sequence.

If your application sets `tmNoMenus`, the terminal tool does not display any custom menus.

If your application sets `tmAutoScroll`, the terminal tool automatically scrolls the terminal emulation window (if necessary) while the user highlights a selection.

`procID` values are dynamically assigned by the Terminal Manager to tools at run time. Applications should not store `procID` values in "settings" files. Instead, they should store tool names, which can be converted to `procID` values with `TMGetProcID`. Use the `ID` that `TMGetProcID` returns for `procID`.

`owner` is a pointer to the window in which your application is displaying the terminal emulation. If `tmInvisible` is `FALSE`, owner should be a grafPort that the terminal tool has control over.

`sendProc` is a pointer to a routine the terminal tool calls when it needs to send data on a connection. A more detailed description of `sendProc` appears later in this chapter, in the section "Routines That Must Be in Your Application."

`cacheProc` is a pointer to a routine in your application that saves lines that scroll off the top of the terminal emulation region. This routine also saves the terminal screen before a clear-screen operation (if `TMSaveBeforeClear` is set). If your application does not have a `cacheProc`, specify `NIL` in this field. A more detailed description of `cacheProc` appears later in this chapter in the section "Routines That Must Be in Your Application."

`breakProc` is a pointer to a routine in your application that performs some sort of break operation. The effect the break has depends upon the terminal emulation tool that your application is using. A more detailed description of `breakProc` appears later in this chapter in the section "Routines That Must Be in Your Application."

`clikLoop` is a pointer to a routine in your application that is called when the mouse button is held down. The terminal tool calls the click loop repeatedly when users are clicking and dragging the mouse. A more detailed description of `clikLoop` appears later in this chapter, in the section "Routines That Must Be in Your Application." Specify `NIL` in this field if your application has no `clikLoop` procedure.

`environsProc` is a pointer to a routine that the terminal tool calls when it requires information about the connection. See "Connection Manager Routines" in Chapter 3 for information about the `CMGetConnEnvirons` routine.

`userData` and `refCon` are fields your application can use.

`TMDefault`

Initializing the terminal record

`TMDefault` fills the configuration record pointed to by `theConfig` with the default configuration, which is specified by the terminal tool with the given `procID`. `TMNew` calls this procedure automatically when it fills in the `config` and `oldConfig` fields in a new terminal record.

Procedure

```
TMDefault(VAR theConfig: Ptr; procID: INTEGER; allocate:
BOOLEAN);
```

Description

If `allocate` is `TRUE`, the tool allocates space for `theConfig` in the current heap zone.

`TMValidate`

Validating the terminal record

`TMValidate` performs an internal consistency check on the configuration and private data records of the terminal record. `TMNew` and `TMSetConfig` call this routine after they have created a new terminal record, to make sure that the record contains values identical to those specified by the terminal tool.

Function

```
TMValidate(hTerm: TermHandle): BOOLEAN;
```

Description

If the validation fails, the Terminal Manager returns `TRUE` and the terminal tool fills the configuration record with default values by calling `TMDefault`.

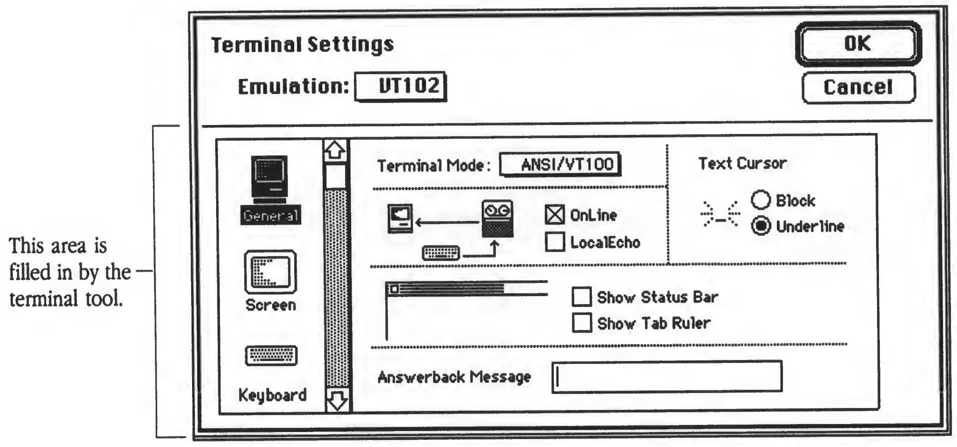
Your application can call this routine after restoring a configuration, to verify that the terminal record contains the correct information, in a manner similar to that shown next.

```
BlockMove(saveConfig,hTerm.config,GetPtrSize(hTerm^^.config));
IF TMValidate(hTerm) THEN BEGIN
     {validate failed}
     END
     ELSE BEGIN
            {validate succeeded}
            END
```

Configuring a terminal tool

An application can configure a terminal tool in one of three ways. The easiest and most straightforward way is by calling the `TMChoose` routine. This routine presents the user with a dialog box similar to the one shown in *Figure 4-6.*

■ **Figure 4-6** The standard tool-settings dialog box



Terminal Settings

Emulation: VT102

Terminal Mode: ANSI/VT100

[✓] OnLine
[ ] LocalEcho

Text Cursor
○ Block
● Underline

[ ] Show Status Bar
[ ] Show Tab Ruler

Answerback Message

The second way an application can configure a terminal tool is by presenting the user with a custom tool-settings dialog box. This method is much more difficult and involves calling six routines. The routines are described in the next section, "Custom Configuration of a Terminal Tool," and "The Custom Tool-Settings Dialog Box" in Appendix B provides example code

The third way your application can configure a terminal tool is by using the scripting language interface, described in "Interfacing with a Scripting Language," later in this chapter. This method allows your application to bypass user interface elements.

Function

```
TMChoose(VAR hTerm: TermHandle; where: Point; idleProc:
ProcPtr): INTEGER;
```

Description

`where` is the point specified in global coordinates, where the upper-left corner of the dialog box should appear. It is recommended that your application place the dialog as close to the upper-left corner of the screen as possible because the size of the dialog box varies from tool to tool.

`idleProc` is a procedure with no parameters that the Terminal Manager will automatically call every time `TMChoose` loops through the setup dialog box filter procedure. Pass `NIL` if your application has no `idleProc`.

`TMChoose` returns one of the following values:

```
CONST
     chooseDisaster     =     -2;
     chooseFailed       =     -1;
     chooseOKMinor      =      1;
     chooseOKMajor      =      2;
     chooseCancel       =      3;
```

`chooseDisaster` means that the `TMChoose` operation failed, destroyed the terminal record, and returned `NIL` in the terminal handle.

`chooseFailed` means that the `TMChoose` operation failed and the terminal record was not changed.

`chooseOKMinor` means that the user clicked OK in the dialog box, but did not change the terminal tool being used.

`chooseOKMajor` means that the user clicked OK in the dialog box and also changed the terminal tool being used. The Terminal Manager then destroys the old terminal handle by calling `TMDispose`, and returns a new terminal handle in `hTerm`.

`chooseCancel` means that the user clicked Cancel in the dialog box.

Processing custom tool-settings dialog box events

`TMSetupItem` processes events for controls in the custom tool-settings dialog box.

Procedure

```
TMSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie:
LONGINT);
```

Description

`procID` is the ID for the terminal tool being configured. Your application should use the same value for `procID` as it passed to `TMSetupPreflight`.

`theConfig` is a pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`theItem` is the item clicked in the dialog box. This value can be modified and sent back.

`magicCookie` is a pointer to private storage for the terminal tool.

TMSetupCleanup

Performing clean-up operations

`TMSetupCleanup` disposes of any storage allocated in `TMSetupPreflight` and performs other clean-up operations. If your application needs to shorten a dialog box, it should do so after calling this routine.

Procedure

```
TMSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR magicCookie: LONGINT);
```

Description

`procID` is the ID for the terminal tool that is being configured. Your application should use the same value for `procID` as it passed to `TMSetupPreflight`.

`theConfig` is a pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`magicCookie` is a pointer to private storage for the terminal tool.

Closing the tool file

`TMSetupPostflight` closes the tool file if it is not being used by any session.

Procedure

```
TMSetupPostflight(procID:INTEGER);
```

Description

`procID` is the ID for the terminal tool that is being configured. Your application should use the same value for `procID` as it passed to `TMSetupPreflight`.

Manipulating selections

The Terminal Manager provides two routines that make it easier for your application to manipulate selections in the terminal emulation window. `TMSetSelection` highlights a selection, and `TMGetSelect` retrieves the data in the selection.

`TMSetSelection`

Setting and highlighting selections

`TMSetSelection` makes `theSelection` the current selection.

Procedure

```
TMSetSelection(hTerm: TermHandle; theSelection: TMSelection;
selType: TMSelTypes);
```

Description

`selType` determines the type of highlighting for the selection. Valid values are:

```
TYPE
    TMSelTypes          =     INTEGER;

CONST
    selTextNormal       =     $0001;
    selTextBoxed        =     $0002;
    selGraphicsMarquee  =     $0004;
    selGraphicsLasso    =     $0008;
```

`TMGetSelect`

Getting data from a selection

`TMGetSelect` returns either the number of bytes in the selection, or an appropriate operating-system error code.

Function

```
TMGetSelect(hTerm: TermHandle; theData: Handle; VAR theType:
ResType): LONGINT;
```

Description

If nothing is selected, `TMGetSelect` returns 0. Otherwise, it returns the size of the selected data.

`theData` must be a handle to a block of size 0. `TMGetSelect` will resize this block as necessary.

`theType` specifies the type of data this routine returns. If `theType` is `TEXT`, `theData` is a handle to textual data. `theType` and `theData` may be passed directly to the Scrap Manager.

Handling events

The Terminal Manager event-processing routines provide useful extensions to the Macintosh Toolbox Event Manager. This section explains the seven routines that the Terminal Manager provides. See "Other Events" in Chapter 2 for sample code showing how an application can determine if an event needs to be handled by one of these routines.

`TMActivate`

Activate events

`TMActivate` processes an activate or deactivate event (for instance, installing or removing a custom tool menu) for a window associated with the terminal tool.

Procedure

```
TMActivate(hTerm: TermHandle; activate: BOOLEAN);
```

Description If `activate` is `TRUE`, the terminal tool processes an activate event. Otherwise, it processes a deactiveate event.

`TMResume`

Resume events

`TMResume` processes a resume or suspend event for a terminal window. Resume and suspend events are processed only if a tool has a custom menu to install or remove from the menu bar.

Procedure

```
TMResume(hTerm: TermHandle; resume: BOOLEAN);
```

Description If `resume` is `TRUE`, then the terminal processes a resume event. Otherwise, it processes a suspend event.

`TMMenu`

Menu events

Your application must call `TMMenu` when the user chooses an item from a menu that is installed by the terminal tool.

Function

```
TMMenu(hTerm: TermHandle; menuID: INTEGER; item: INTEGER):
BOOLEAN;
```

Description `TMMenu` returns `FALSE` if the terminal tool did not handle the menu event. `TMMenu` returns `TRUE` if the terminal tool did handle the menu event.

`TMClick`

Mouse events

`TMClick` processes a `mouseDown` event in the terminal emulation region. The routine pointed to by `clikLoop`, discussed in the section "Routines That Must Be in Your Application," is called repeatedly by `TMClick`.

Procedure `TMClick(hTerm: TermHandle; theEvent: EventRecord);`

`TMKey`

Keyboard events

`TMKey` processes a `keyDown` or `autoKey` event. The terminal tool translates the keystroke into a sequence of bytes. The terminal tool then calls your application's `sendProc` routine (discussed later in this chapter under "Routines That Must Be in Your Application.") to transmit this sequence of bytes.

Procedure `TMKey(hTerm: TermHandle; theEvent: EventRecord);`

Description Your application can create its own event record for specific keyboard events by filling in the event record with the character code and –1 for the key code in the message field.

`TMUpdate`

Update events

Your application will typically call `TMUpdate` between `BeginUpdate` and `EndUpdate`.

Procedure `TMUpdate(hTerm: TermHandle; visRgn: RgnHandle);`

Description `visRgn` specifies the region to be updated.

Other events

When your application receives an event, it should check if the `refcon` of the window is a tool's `hTerm`. Such an event occurs, for example, when the user clicks a button in a dialog box displayed by the terminal tool. If it does belong to a terminal tool's window, your application can call `TMEvent`.

Procedure `TMEvent(hTerm: TermHandle; theEvent: EventRecord);`

Description A window (or dialog box) created by a terminal tool has a terminal record handle stored in the `refCon` field for `windowRecord`.

Localizing configuration strings

The Communications Toolbox provides two routines that make it easier to localize configuration strings.

`TMIntlToEnglish`

Translating into English

`TMIntlToEnglish` converts a configuration string, which is pointed to by `inputPtr`, to an American English configuration string pointed to by `outputPtr`.

Function

```
TMIntlToEnglish(hTerm: TermHandle; inputPtr: Ptr; VAR
outputPtr: Ptr; language: INTEGER): OSErr;
```

Description The function returns an operating-system error code if any internal errors occur.

The terminal tool allocates space for `outputPtr`. Your application should dispose of this pointer when done with it.

`language` specifies the language from which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, this routine returns `tmNoErr`, but `outputPtr` is `NIL`.

`TMEnglishToIntl`

Translating from English

`TMEnglishToIntl` converts an American English configuration string, which is pointed to by `inputPtr`, to a configuration string pointed to by `outputPtr`.

Function

```
TMEnglishToIntl(hTerm: TermHandle; inputPtr: Ptr; VAR
outputPtr: Ptr; language: INTEGER): OSErr;
```

Description The function returns an operating-system error code if any internal errors occur.

The terminal tool allocates space for `outputPtr`. Your application is responsible for disposing of the pointer with `DisposPtr` when done with it.

`language` specifies the language to which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, `tmNoErr` is still returned, but `outputPtr` is `NIL`.

Miscellaneous routines

The routines described in this section perform a variety of tasks.

`TMGetToolName`

Getting the name of a tool

`TMGetToolName` returns in `name` the name of the tool specified by `procID`.

Procedure `TMGetToolName(procID: INTEGER; VAR name: Str255);`

Description If `procID` references a terminal tool that does not exist, the Terminal Manager sets `name` to an empty string.

`TMSetRefCon`

Setting the terminal tool's reference constant

`TMSetRefCon` sets the terminal record's `refCon` to the specified value. It is very important that your application use this routine to change the value of the reference constant, instead of changing it directly.

Procedure `TMSetRefCon(hTerm: TermHandle; refCon: LONGINT);`

`TMGetRefCon`

Getting the terminal tool's reference constant

`TMGetRefCon` returns the terminal record's reference constant.

Function `TMGetRefCon(hTerm: TermHandle): LONGINT;`

TMSetUserData

Setting the `userData` field

`TMSetUserData` sets the terminal record's `userData` field to the value specified by `userData`. It is very important that your application use this routine to change the value of the `userData` field, instead of changing it directly.

Procedure

```
TMSetUserData(hTerm: TermHandle; userData: LONGINT);
```

TMGetUserData

Getting the `userData` field

`TMGetUserData` returns the terminal record's `userData` field.

Function

```
TMGetUserData(hTerm: TermHandle): LONGINT;
```

TMGetVersion

Getting `'vers'` resource information

`TMGetVersion` returns a handle to a relocatable block that contains the information that is in the terminal tool's `'vers'` resource with ID=1. Your application is responsible for disposing of the handle when done with it.

◆ *Note:* The handle returned is *not* a resource handle.

Function

```
TMGetVersion(hTerm: TermHandle): Handle;
```

TMGetTMVersion

Getting the Terminal Manager version number

`TMGetTMVersion` returns the version number of the Terminal Manager.

Function

```
TMGetTMVersion: INTEGER;
```

Description The version number of the Terminal Manager described in this document is:

```
CONST
     curTMVersion =      1;
```

TMGetCursor

Getting the current cursor position

`TMGetCursor` returns the current position of the cursor. Numbering of rows and columns begins with 1.

Function

```
TMGetCursor(hTerm: TermHandle; cursType: TMCursorTypes): Point;
```

Description

Valid values for `cursType` are as follows:

```
CONST
     cursorText          =     1;
     cursorGraphics      =     2;

TYPE

     TMCursorTypes       =     INTEGER;
```

For `cursorText`, the position returned is in row/column format, and for `cursorGraphics` the position is in pixel coordinates.

TMDoTermKey

Emulating a special terminal key

`TMDoTermKey` emulates a special terminal key specified by `theKey`.

Function

```
TMDoTermKey(hTerm: TermHandle; theKey: Str255): BOOLEAN;
```

Description

If the terminal tool does not understand the key specified by `theKey`, this routine returns `FALSE`. Otherwise, if the key specified is processed, this routine returns `TRUE`.

For information about the terminal keys supported by a terminal tool, refer to that tool's documentation.

This example shows how an application can use `TMDoTermKey` to emulate the user's pressing a PF1 key:

```
IF TMDoTermKey(hTerm, 'PF1') THEN
     BEGIN
     END;
```

`TMCountTermKeys`

Counting special terminal keys

`TMCountTermKeys` returns the number of special terminal keys that the terminal tool supports.

Function `TMCountTermKeys(hTerm): INTEGER;`

Description `TMCountTermKeys` returns 0 if the terminal tool supports no special terminal keys.

`TMGetIndTermKey`

Getting a terminal key

`TMGetIndTermKey` returns the name of a specified key.

Procedure

```
TMGetIndTermKey(hTerm:TermHandle; id:INTEGER; VAR
theKey:Str255);
```

Description `TMGetIndTermKey` returns in `theKey` the terminal key specified by `id`. If `id` specifies a key that does not exist, this routine returns an empty string.

`TMGetTermEnvirons`

Getting general terminal tool information

`TMGetTermEnvirons` returns `theEnvirons`, which reflects the internal conditions of the terminal tool. The caller of this routine must fill in the `version` field of `theEnvirons` before calling `TMGetTermEnvirons`.

Function

```
TMGetTermEnvirons(hTerm: TermHandle; VAR theEnvirons:
TermEnvironRec): TMErr;
```

Description This routine returns `tmNoErr`, `envVersTooBig`, or an operating-system error code. The fields in `theEnvirons` are as follows:

```
TYPE
    TermEnvironPtr    =    ^TermEnvironRec;
    TermEnvironRec    =    RECORD
          version     :    INTEGER;
          termType    :    TMTermTypes;
          textRows    :    INTEGER;
          textCols    :    INTEGER;
          cellSize    :    Point;
          graphicSize :    Rect;
          slop        :    Point;
          auxSpace    :    Rect;
    END;
```

`version` is the version number of the requested **terminal environment record,** which is `curTermEnvRecVers` in this release of the Terminal Manager. The caller of the routine must fill in this field before calling `TMGetTermEnvirons`.

`termType` is the type of terminal. `termType` can contain one or both of the following values:

```
CONST
    tmTextTerminal      =     $0001;
    tmGraphicsTerminal  =     $0002;

    curTermEnvRecVers   =     0;
TYPE
    TMTermTypes         =     INTEGER;
```

`textRows` is the number of rows in the terminal emulation region. The first row is row number 1.

`textCols` is the number of columns in the terminal emulation region. The first column is column number 1.

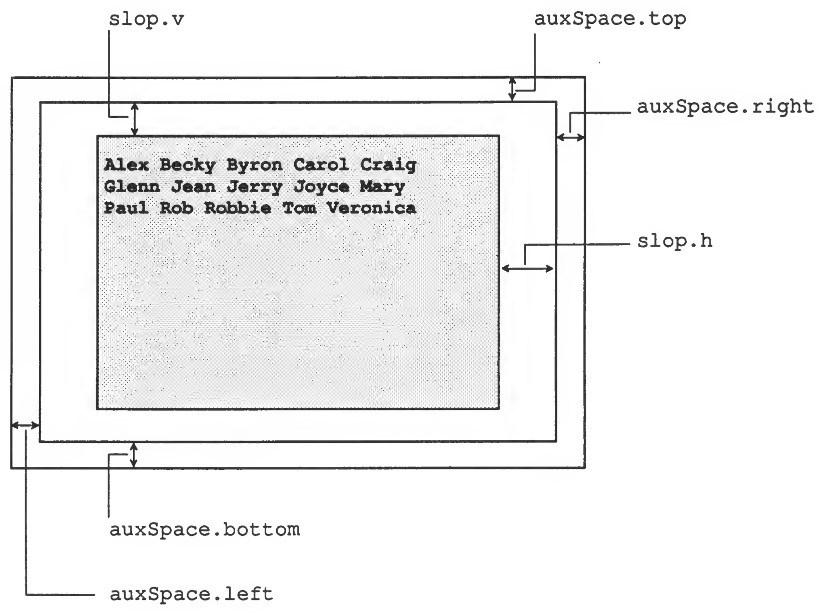
`cellSize` is the height and width of each cell.

`graphicSize` is the size of default rectangle of the graphics terminal tool measured in pixels.

`slop` is the border of the terminal emulation region.

`auxSpace` is a rectangle that specifies any additional space that is required at the top, bottom, right, or left of the terminal emulation region, as shown in *Figure 4-7*

■ **Figure 4-7** Additional space in the terminal emulation region


slop.v
auxSpace.top
auxSpace.right
Alex Becky Byron Carol Craig
Glenn Jean Jerry Joyce Mary
Paul Rob Robbie Tom Veronica
slop.h
auxSpace.bottom
auxSpace.left

Routines that must be in your application

Terminal tools do not provide all the code necessary to perform terminal emulations; your application must also provide some code (or at least pointers to code provided by other managers). This section describes the routines that must be in your application, which give the terminal tool important information about

- how to send data on the connection
- what to do with lines that scroll out of the terminal emulation region
- what to do when a specified string is found in the terminal emulation buffer
- what to do when the user wants to effect a break on the terminal
- what to do when the user is dragging the mouse in the terminal emulation region
- what the connection environment is like

`sendProc`

Sending data out along the connection

When a tool needs to send data to another entity, it looks to your application to provide `sendProc`. `sendProc` may simply be the routine that the Connection Manager uses to send data (as is the case in the next example), or it can be a routine that you have written.

Function

```
sendProc (thePtr: Ptr; theSize: LONGINT; refCon: LONGINT;
flags: CMFlags): LONGINT;
```

Description

`thePtr` is a pointer to the data to be sent.

`theSize` is the number of characters to be sent.

`refCon` is the reference constant field for sending terminal's terminal.

`sendProc` returns the actual number of characters sent.

`flags` indicates whether or not the connection tool should send an end-of-message indicator. An end-of-message indicator needs to be supported by the particular communications protocol being used; if an end-of-message indicator is not supported by the connection protocol, your application should ignore this field.

Sample routine for sending data

```
FUNCTION  sendProc(thePtr:  Ptr;theSize:  LONGINT;
                    refcon:  LONGINT;flags:  INTEGER):  LONGINT;
VAR
      theErr       :  CMErr;             { Any errors }

BEGIN
      sendProc  :=  0;                   { Assume the worst }

      IF gConn <> NIL THEN BEGIN

            { DO NOT check to see if the conn is first open before sending }
            { as the tool might be directly interpreting the data }

                                         { Send the data }
            theErr  :=  CMWrite(gConn,thePtr,theSize,cmData,FALSE,NIL,0,flags);

            IF (theErr = noErr) THEN
                  sendProc  :=  theSize        { If ok, we sent all }
            ELSE
                  ;                      { Handle errors }
      END; { Good Connection }

END; { sendProc }
```

breakProc

Sending a break

Your application needs to contain information about how to send a break on a connection. Although it can contain the code that performs the break operation, your application can also point to a connection tool routine that performs the break. This section gives an example.

Procedure `breakProc(duration: LONGINT; refCon: LONGINT);`

Description `duration` specifies, in ticks, how long the break should last.

`refCon` is the reference constant field of the terminal record.

Sample showing how to break a connection

```
PROCEDURE  breakProc(duration:  LONGINT;  refcon  :  LONGINT);
BEGIN
      { Here we choose to issue a synchronous break }
      IF gConn <> NIL THEN
            CMBreak(gConn,  duration,  FALSE,  NIL);
END; { breakProc }
```

Caching lines from the terminal region

Your application can cache lines that scroll off the top of the terminal emulation region and, if desired, display them in the terminal emulation window. If you want your application to display these lines, you have to provide the necessary code. If you do not want your application to display these lines, then your application should specify `NIL` for `cacheProc` when it calls `TMNew`.

Function `cacheProc(refCon: LONGINT; theTermData:TermDataBlock): LONGINT;`

Description `cacheProc` must return `tmNoErr` if no error occurred during processing. Otherwise, it should return an appropriate error code.

`refCon` is the reference constant for the terminal record.

`theTermData` is a data structure of type `TermDataBlock`:

```
TYPE
    TermDataBlockH      =     ^TermDataPtr;
    TermDataBlockPtr    =     ^TermDataBlock;
    TermDataBlock       =     RECORD
          flags         :     TMTermTypes;
          theData       :     Handle;
          auxData       :     Handle;
          reserved      :     LONGINT;
    END;
```

`theTerm.theData` is a handle to a block on the heap. Your application can calculate the size of this block with `GetHandleSize`. Your application must copy any data it needs because `theTermData` belongs to the terminal tool and may not exist after `cacheProc` has completed. Your application can use `HandToHand` to copy the data.

Sample showing how to cache lines

```
FUNCTION cacheProc(refcon : LONGINT; theTermData : TermDataBlock ) : LONGINT;
VAR
      sizeCached   : LONGINT;

BEGIN
      { Check for data integrity }
      IF (theTermData.theData = NIL) THEN BEGIN
            cacheProc := -1;
            EXIT(cacheProc);
      END; { Bad Data }

      { Cache either graphics or text }
      HLock(theTermData.theData);

      { Get rid of the old cached data }
```

```
        IF (gCache <> NIL) THEN
              DisposHandle(gCache);

        { make a copy of new text }
        gCache  := theTermData.theData;
        IF (HandToHand(gCache) <> noErr) THEN BEGIN
              gCache := NIL;            (* Handle errors *)
              sizeCached := -1;
        END
        ELSE
              sizeCached := GetHandleSize(gCache);

        HUnlock(theTermData.theData);

        IF (theTermData.flags = tmGraphicsTerminal) THEN BEGIN
              { theTermData.theData is a handle to a QD Picture }
              (*
              Could save it as PICT
              *)
        END { cache graphics }
        ELSE IF (theTermData.flags = tmTextTerminal) THEN BEGIN
              { theTermData.theData is a handle to text }

              (*
              Could write it out to the data fork
              *)
        END; { cache text }

END; { cacheProc }
```

callBack

Responding to a matched search parameter

Your application can selectively filter data in the terminal emulation buffer by making use of a search call-back procedure. Since a tool will automatically call `callBack` when it finds a match to the search string, your application can respond in any way that you want it to.

Procedure `callBack(hTerm: TermHandle; refNum: INTEGER; foundRect: Rect);`

Description `refNum` is the reference number associated with a particular search. Reference numbers are assigned by the Terminal Manager when a search is added to a terminal record with the `TMAddSearch` routine.

`foundRect` describes in row/column format where the match was found, with row and column numbers starting at 1.

`clikLoop`

Responding to mouse clicks

This routine is called when the user is dragging the mouse in the terminal emulation window. Initially, your application should process a mouse-down event by calling `TMClick`, which in turn calls this routine.

Function `clikLoop(refCon: LONGINT): BOOLEAN;`

Description This routine returns `TRUE` when the mouse is clicked within the cache region. Otherwise, it returns `FALSE`.

`environsProc`

Getting connection environment information

To get information about the connection environment, the terminal tool calls a routine in your application, `environsProc`.

Function `environsProc(refCon: LONGINT; VAR theEnvirons: ConnEnvironRec): CMErr;`

Description `refCon` is the reference constant for the terminal tool.

`theEnvirons` is a data structure containing the connection-environment record. Your application can either construct `theEnvirons` or use the Connection Manager routine `CMGetConnEnvirons`. For more information about `theEnvirons`, see "`CMGetConnEnvirons`" in Chapter 3.

The example that follows shows how `environsProc` can point to a Connection Manager routine to retrieve information about the connection environment.

Sample terminal environment routine

```
FUNCTION environsProc(refCon: LONGINT;VAR theEnvirons: ConnEnvironRec): OSErr;
BEGIN
     environsProc:= envNotPresent;                { pessimism }
     theEnvirons.version  := curConnEnvRecVers;   { fill in version field }

          IF (gConn <> NIL) THEN                  { Tool sets the version }
          environsProc:= CMGetConnEnvirons(gConn,theEnvirons);

END; { environsProc }
```

Quick reference

This section provides a reference to Terminal Manager routines and data structures. At the end of this section is a listing of routine selectors for programming in assembly language.

Routines

Terminal Manager routines	*See page*
`InitTM:TMErr;`	*88*
`TMActivate(hTerm: TermHandle; activate: BOOLEAN);`	*105*
`TMAddSearch(hTerm: TermHandle; theString: Str255; where: Rect; searchType: TMSearchTypes; callBack: ProcPtr): INTEGER;`	*102*
`TMChoose(VAR hTerm: TermHandle; where: Point; idleProc: ProcPtr): INTEGER;`	*92*
`TMClear(hTerm: TermHandle);`	*100*
`TMClearSearch(hTerm: TermHandle);`	*103*
`TMClick(hTerm: TermHandle; theEvent: EventRecord);`	*106*
`TMCountTermKeys(hTerm): INTEGER;`	*112*
`TMDefault(VAR theConfig: Ptr; procID: INTEGER; allocate: BOOLEAN);`	*91*
`TMDispose(hTerm: TermHandle);`	*101*
`TMDoTermKey(hTerm: TermHandle; theKey: Str255): BOOLEAN;`	*111*
`TMEnglishToIntl(hTerm: TermHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*108*
`TMEvent(hTerm: TermHandle; theEvent: EventRecord);`	*107*
`TMGetConfig(hTerm: TermHandle): Ptr;`	*98*
`TMGetCursor(hTerm: TermHandle; cursType: TMCursorTypes): Point;`	*111*
`TMGetIndTermKey(hTerm:TermHandle; id:INTEGER; VAR theKey:Str255);`	*112*
`TMGetLine(hTerm: TermHandle; lineNo: INTEGER; VAR theTermData:TermDataBlock);`	*100*
`TMGetProcID(name: Str255): INTEGER;`	*88*
`TMGetRefCon(hTerm: TermHandle): LONGINT;`	*109*
`TMGetSelect(hTerm: TermHandle; theData: Handle; VAR theType: ResType): LONGINT;`	*104*

Terminal Manager routines	*See page*
`TMGetTermEnvirons(hTerm: TermHandle; VAR theEnvirons: TermEnvironRec): TMErr;`	*112*
`TMGetToolName(procID: INTEGER; VAR name: Str255);`	*109*
`TMGetTMVersion: INTEGER;`	*110*
`TMGetUserData(hTerm: TermHandle): LONGINT;`	*110*
`TMGetVersion(hTerm: TermHandle): Handle;`	*110*
`TMIdle(hTerm: TermHandle);`	*99*
`TMIntlToEnglish(hTerm: TermHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*108*
`TMKey(hTerm: TermHandle; theEvent: EventRecord);`	*106*
`TMMenu(hTerm: TermHandle; menuID: INTEGER; item: INTEGER): BOOLEAN;`	*105*
`TMNew(termRect: Rect; viewRect: Rect; flags: TMFlags; procID: INTEGER; owner: WindowPtr; sendProc: ProcPtr; cacheProc: ProcPtr; breakProc: ProcPtr; clikLoop: ProcPtr; environsProc: ProcPtr; refCon: LONGINT; userData: LONGINT): TermHandle;`	*89*
`TMPaint(hTerm: TermHandle; theTermData:TermDataBlock; theRect: Rect);`	*99*
`TMRemoveSearch(hTerm: TermHandle; refNum: INTEGER);`	*103*
`TMReset(hTerm: TermHandle);`	*101*
`TMResize(hTerm: TermHandle; newTermRect: Rect);`	*101*
`TMResume(hTerm: TermHandle; resume: BOOLEAN);`	*105*
`TMScroll(hTerm: TermHandle; dH, dV: INTEGER);`	*100*
`TMSetConfig(hTerm: TermHandle; thePtr: Ptr): INTEGER;`	*98*
`TMSetRefCon(hTerm: TermHandle; refCon: LONGINT);`	*109*
`TMSetSelection(hTerm: TermHandle; theSelection: TMSelection; selType: TMSelTypes);`	*104*
`TMSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*96*
`TMSetupFilter(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR theEvent: EventRecord; VAR theItem: INTEGER; VAR magicCookie: LONGINT): BOOLEAN;`	*95*
`TMSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie: LONGINT);`	*96*

Terminal Manager routines	*See page*
`TMSetupPostflight(procID:INTEGER);`	*97*
`TMSetupPreflight(procID: INTEGER; VAR magicCookie: LONGINT): Handle;`	*94*
`TMSetupSetup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*95*
`TMSetUserData(hTerm: TermHandle; userData: LONGINT);`	*110*
`TMStream(hTerm: TermHandle; theBuffer: Ptr; theLength: LONGINT; flags: CMFlags): LONGINT;`	*99*
`TMUpdate(hTerm: TermHandle; visRgn: RgnHandle);`	*106*
`TMValidate(hTerm: TermHandle): BOOLEAN;`	*91*

Routines in your application	*See page*
`sendProc (thePtr: Ptr; theSize: LONGINT; refCon: LONGINT; flags: CMFlags): LONGINT;`	*114*
`breakProc(duration: LONGINT; refCon: LONGINT);`	*115*
`cacheProc(refCon: LONGINT; theTermData:TermDataBlock): LONGINT;`	*116*
`callBack(hTerm: TermHandle; refNum: INTEGER; foundRect: Rect);`	*117*
`clikLoop(refCon: LONGINT): BOOLEAN;`	*118*
`environsProc(refCon: LONGINT; VAR theEnvirons: ConnEnvironRec): CMErr;`	*118*

Terminal record

```
TYPE
       TermHandle         =       ^TermPointer;
       TermPointer        =       ^TermRecord;
       TermRecord         =       RECORD
              procID      =       INTEGER

              flags       :       TMFlags;
              errCode     :       TMErr;

              refCon      :       LONGINT;
              userData    :       LONGINT;

              defProc     :       ProcPtr;

              config      :       Ptr;
              oldConfig   :       Ptr;
```

```
            environsProc  :      ProcPtr;
            reserved1     :      LONGINT;
            reserved2     :      LONGINT;

            tmPrivate     :      Ptr;

            sendProc      :      ProcPtr;
            breakProc     :      ProcPtr;
            cacheProc     :      ProcPtr;
            clikLoop      :      ProcPtr;


            owner         :      WindowPtr;
            termRect      :      Rect;
            viewRect      :      Rect;
            visRect       :      Rect;

            lastIdle      :      LONGINT;

            selection     :      TMSelection;
            selType       :      TMSelTypes;

            mluField      :      LONGINT;
      END;
```

Constants and data types

```
TYPE
      TMSelection                  =      RECORD
            CASE INTEGER OF
            1:      (
                    selRect      :      Rect;
                    );
            2:      (
                    selRgnHandle :      RgnHandle;
                    filler       :      LONGINT;
                    );
            END;

TYPE
      TermDataBlockH      =      ^TermDataPtr;
      TermDataBlockPtr    =      ^TermDataBlock;
      TermDataBlock       =      RECORD
            flags         :      TMTermTypes;
            theData       :      Handle;
            auxData       :      Handle;
            reserved      :      LONGINT;
      END;
```

```
TYPE
        TermEnvironPtr      =       ^TermEnvironRec;
        TermEnvironRec      =       RECORD
                version     :       INTEGER;
                termType    :       TMTermTypes;
                textRows    :       INTEGER;
                textCols    :       INTEGER;
                cellSize    :       Point;
                graphicSize :       Rect;
                slop        :       Point;
                auxSpace    :       Rect;
        END;

TYPE
        TMErr               =       OSErr;

CONST
        tmGenericError      =       -1;
        tmNoErr             =       0;
        tmNotSupported      =       7;
        tmNoTools           =       8;

CONST
        curTermEnvRecVers   =       0;
        curTMVersion        =       1;

{ bit masks for flags field of terminal record }
        tmInvisible         =       $00000001;
        tmSaveBeforeClear   =       $00000002;
        tmNoMenus           =       $00000004;
        tmAutoScroll        =       $00000008;


{ selection types }
        selTextNormal       =       $0001;
        selTextBoxed        =       $0002;
        selGraphicsMarquee  =       $0004;
        selGraphicsLasso    =       $0008;


{ search modifiers }
        searchNoDiacrit     =       $0100;
        searchNoCase        =       $0200;
```

```
TYPE
      TMSearchTypes       =      INTEGER;


{ terminal types in TermEnvironRec data structure }
CONST
      tmTextTerminal      =      $0001;
      tmGraphicsTerminal  =      $0002;


{ TMChoose return values }
      chooseDisaster      =      -2;
      chooseFailed        =      -1;
      chooseOKMinor       =      1;
      chooseOKMajor       =      2;
      chooseCancel        =      3;
```

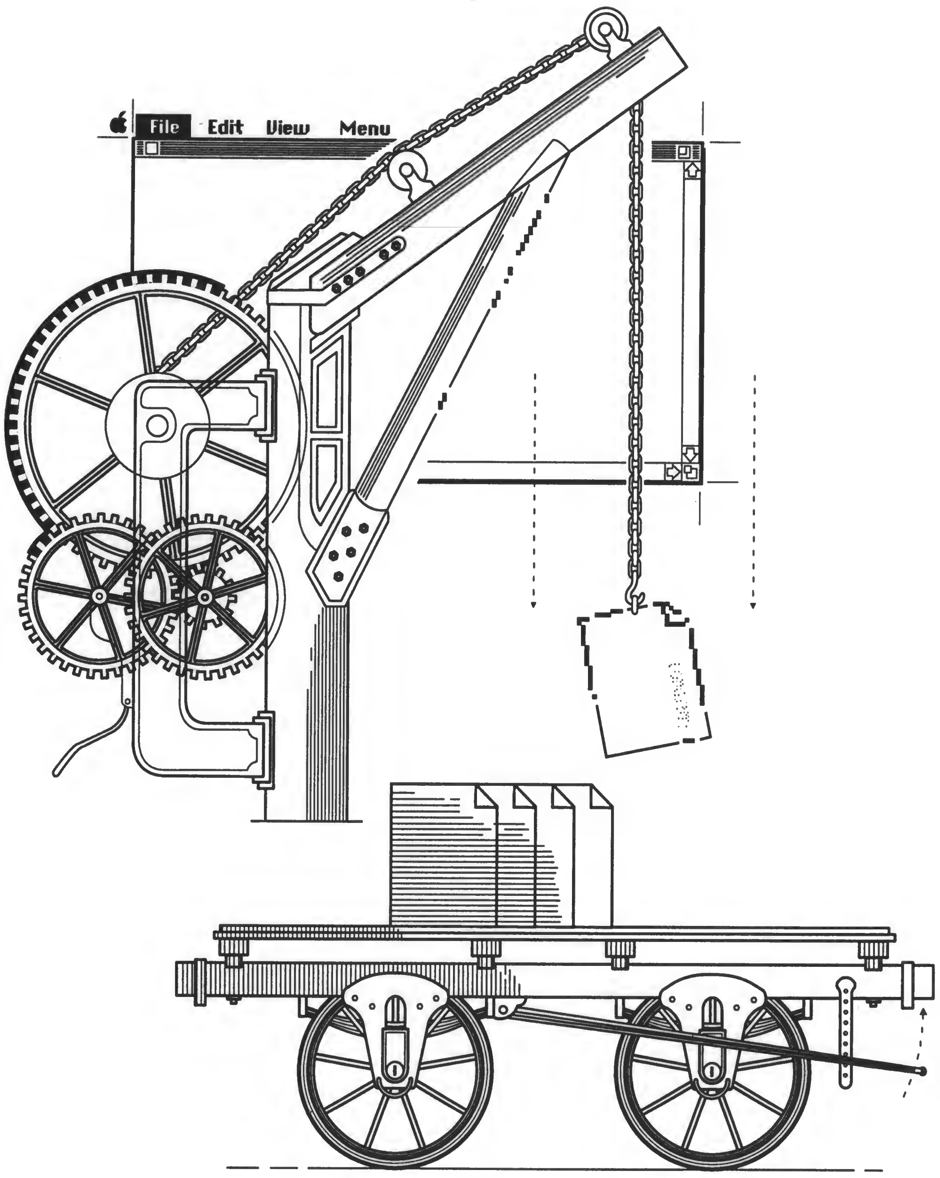
Terminal Manager routine selectors

◆ *Assembly note:* The Communications Toolbox routines are accessed via a Macintosh Operating System trap. `A0` contains a pointer to the routine parameters. You can call each of the Communications Tooolbox routines with a macro that has the same name as the routine preceded by an underscore. When expanded, these macros put the routine selector onto the stack, set `A0` to point to the selector, invoke the trap macro `_ComToolTrap ($A08B)`, and finally pop the routine selector back off the stack. It is your application's responsibility to remove the parameters.

InitTM	.EQU	769	TMEnglishToIntl	.EQU	798
TMActivate	.EQU	775	TMEvent	.EQU	813
TMAddSearch	.EQU	807	TMGetConfig	.EQU	795
TMChoose	.EQU	812	TMGetCursor	.EQU	810
TMClear	.EQU	781	TMGetIndTermKey	.EQU	816
TMClearSearch	.EQU	809	TMGetLine	.EQU	784
TMClick	.EQU	777	TMGetProcID	.EQU	799
TMCountTermKeys	.EQU	815	TMGetRefCon	.EQU	802
TMDefault	.EQU	789	TMGetSelect	.EQU	783
TMDispose	.EQU	771	TMGetTermEnvirons	.EQU	811
TMDoTermKey	.EQU	814	TMGetTMVersion	.EQU	806

```
TMGetToolName       .EQU    800
TMGetUserData       .EQU    804
TMGetVersion        .EQU    805
TMIdle              .EQU    787
TMIntlToEnglish     .EQU    797
TMKey               .EQU    772
TMMenu              .EQU    779
TMNew               .EQU    770
TMPaint             .EQU    774
TMRemoveSearch      .EQU    808
TMReset             .EQU    780
TMResize            .EQU    782
TMResume            .EQU    776
TMScroll            .EQU    786
TMSetConfig         .EQU    796
TMSetRefCon         .EQU    801
TMSetSelection      .EQU    785
TMSetupCleanup      .EQU    794
TMSetupFilter       .EQU    792
TMSetupItem         .EQU    793
TMSetupPostflight   .EQU    817
TMSetupPreflight    .EQU    790
TMSetupSetup        .EQU    791
TMSetUserData       .EQU    803
TMStream            .EQU    778
TMUpdate            .EQU    773
TMValidate          .EQU    788
```

Chapter 5 **File Transfer Manager**



THIS CHAPTER describes the File Transfer Manager, the Communications Toolbox manager that allows applications to implement file transfer services without having to take into account underlying file transfer protocols. This chapter describes fundamental concepts about the File Transfer Manager. Then it describes the **file transfer record,** which is the most important record of the File Transfer Manager. Next, this chapter presents a detailed description of each routine provided by the File Transfer Manager. At the end of the chapter, you'll find a "Quick Reference" to routines, data structures, and routine selectors for programming in assembly language.

In this chapter, the term *your application* refers to the application you are writing for the Macintosh, which will implement communications services for users. Be careful not to confuse the services your application provides with the services that tools provide.

To use the File Transfer Manager, you need to be familiar with

- the Resource Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the File Manager (described in *Inside Macintosh,* Volumes II, IV, V)
- the Standard File Package (described in *Inside Macintosh,* Volumes I, IV)
- the Connection Manager (described in Chapter 3 of this document)

About the File Transfer Manager

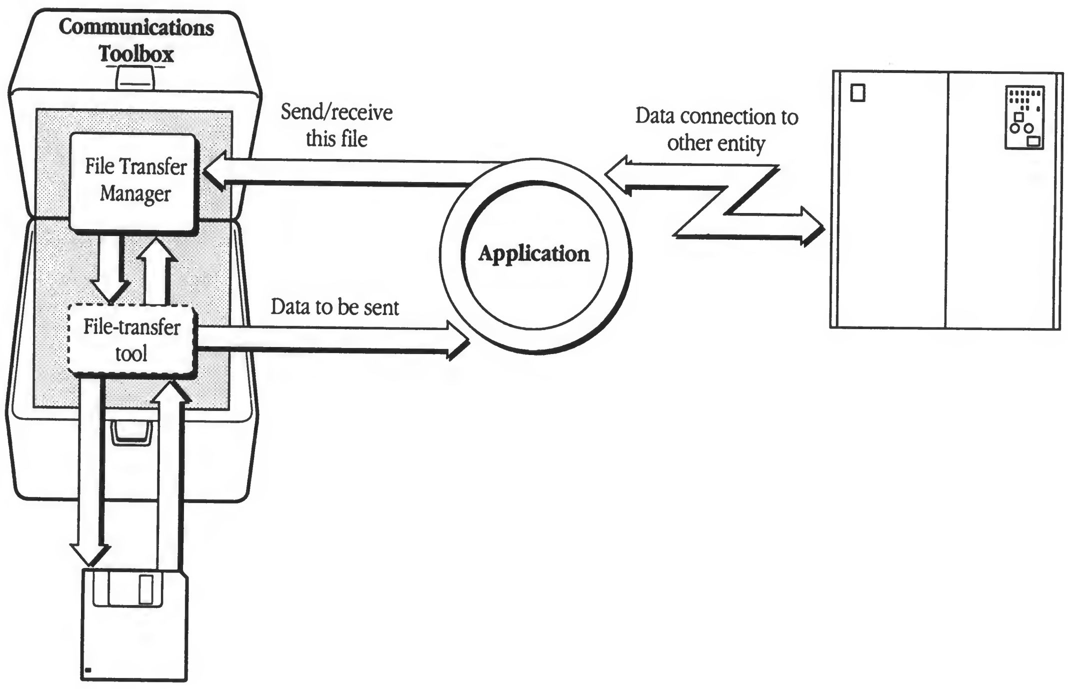
By using File Transfer Manager routines, your application can send files to or receive files from another entity without having to take into account underlying file transfer protocols. **File transfer tools,** which are discussed in Chapter 11, are responsible for implementing file transfer services according to specific protocols.

The File Transfer Manager provides generic file transfer services for a transfer between your application and another computer process. The other process can be running on the same computer as your application, or on any other type of computer.

Here's what happens inside the File Transfer Manager. An application makes a request of the File Transfer Manager when it needs it to send a file or perform some other file transfer function. The File Transfer Manager then sends this request to one of the tools that it manages. The tool provides the service according to the specifics of its file transfer protocol. Once the tool has finished, it passes back to the application any relevant parameters and return codes.

Figure 5-1 shows the data flow into and out of the File Transfer Manager.

■ **Figure 5-1** Data flow into and out of the File Transfer Manager



The most important data structure maintained by the File Transfer Manager is the file transfer record, which contains all the specifics about a file transfer. For example, the file transfer record might show that the File Transfer Manager should use the XMODEM tool to perform file transfers, and that the tool should not display any custom menus while transferring files.

One important aspect of the file transfer record is that it allows you to use protocol-independent routines. Protocol-independent routines allow applications to use File Transfer Manager services without regard for the underlying file transfer protocols. In other words, when an application wants to transfer a file from a remote entity, it tells the File Transfer Manager to get the file, and the File Transfer Manager figures out exactly how to implement the transfer for a specific protocol.

Another important feature of the file transfer record is that it lets you use multiple instances of the same tool. The same tool can be used by different processes at the same time, as in a MiltiFinder environment, or by differeent threads in a given application.

The file transfer record is described in greater detail later in this chapter.

Besides providing basic file transfer routines, the File Transfer Manager includes routines that help your application configure a file transfer tool, either by presenting the user with a dialog box or by interfacing directly with a scripting language. The File Transfer Manager also contains routines that can help you localize your applications in other languages.

You can write applications that use the File Transfer Manager with other Communications Toolbox managers to create a communications application with basic connection, terminal emulation, and file transfer capabilities. Or, you can use the File Transfer Manager with some other connection service and terminal emulation service. You can also write your own file transfer tool for the File Transfer Manager to use. (This procedure is discussed in Chapters 8 and 11.) Regardless of which you choose, your application needs to be able to handle different file transfer tools so that users can change tools and still be able to use your program.

The file transfer record

The file transfer record contains information needed by your application and the file transfer tool to send files, such as whether to send data or receive data, and where to find the routines that perform the actual sending and receiving of files. The file transfer record also contains pointers to File Transfer Manager internal data structures. Most of the fields in the file transfer record are filled in when an application calls `FTNew`, described later in this chapter.

Because the context for a given file transfer is maintained in a file transfer record, an application can perform several file transfers simultaneously (using one or more file transfer tools), by creating a separate file transfer record for each transfer. For details, see "`FTNew`: Creating a File Transfer Record," later in this chapter.

△ **Important** Your application, in order to be compatible with future releases of the File Transfer Manager, should not directly manipulate the fields of the file transfer record (with the exception of `config` and `oldConfig`). The File Transfer Manager provides routines that applications and tools can use to change the fields in the file transfer record. These routines are discussed later in this chapter. △

File transfer record data structure

```
TYPE
        FTHandle            =       ^FTPtr;
        FTPtr               =       ^FTRecord;
        FTRecord            =       PACKED  RECORD

                procID      :       INTEGER;


                flags       :       FTFlags;
                errCode     :       FTErr;

                refCon      :       LONGINT;
                userData    :       LONGINT;

                defProc     :       ProcPtr;

                config      :       Ptr;
                oldConfig   :       Ptr;

                environsProc :      ProcPtr;
                reserved1   :       LONGINT;
                reserved2   :       LONGINT;

                ftPrivate   :       Ptr;

                sendProc    :       ProcPtr;
                recvProc    :       ProcPtr;
                writeProc   :       ProcPtr;
                readProc    :       ProcPtr;

                owner       :       WindowPtr;

                direction   :       FTDirection;
                theReply    :       SFReply;

                writePtr    :       LONGINT;
                readPtr     :       LONGINT;
                theBuf      :       ^char;
                bufSize     :       LONGINT;
                autoRec     :       Str255;
                attributes  :       FTAttributes;
       END;
```

procID

`procID` is the file transfer tool ID. This value is dynamically assigned by the File Transfer Manager when your application calls `FTGetProcID`.

flags

`flags` is a bit field that your application can use to determine when a file transfer has completed, and if the file transfer was successful. Valid values are as follows:

```
CONST
      ftIsFTMode    =      $00000001;
      ftNoMenus     =      $00000002;
      ftQuiet       =      $00000004;
      ftSucc        =      $00000080;

TYPE
      FTFlags       =      LONGINT;
```

`ftIsFTMode` indicates whether or not a file transfer is in progress. A tool turns this bit on just prior to performing the actual file transfer, and turns it off when the file transfer stops.

The file transfer tool will not display any custom menus if your application sets the `ftNoMenus` bit. The file transfer tool will not display any status dialog boxes or error alerts if your application sets the `ftQuiet` bit. If your application turns `ftQuiet` on, it is responsible for displaying status dialog boxes and error alerts that the tool would have displayed. Applications typically use these two bits to hide the file transfer tool from the user.

`ftSucc` is a bit set by the file transfer tool when a file transfer completes successfully.

Your application can first check to see if `ftIsFTMode` toggles from on to off to find out when the file transfer has completed. Then, it can check `ftSucc` to see if the file transfer was completed successfully.

The other bits of `flags` are reserved by Apple Computer

errCode

`errCode` contains the last error reported to the File Transfer Manager. If `errCode` is negative, an operating-system error occurred. If `errCode` is positive, a File Transfer Manager error occured. Valid values are as follows:

```
CONST
      ftGenericError       =     -1;
      ftNoErr              =      0;
      ftRejected           =      1;
      ftFailed             =      2;
      ftTimeOut            =      3;
      ftTooManyRetry       =      4;
      ftNotEnoughDspace    =      5;
      ftRemoteCancel       =      6;
      ftWrongFormat        =      7;
      ftNoTools            =      8;
      ftUserCancel         =      9;
      ftNotSupported       =     10;
```

```
TYPE
      FTErr              =      OSErr;
```

refCon

`refCon` is a four-byte field that your application can use.

userData

`userData` is a four-byte field that your application can use.

defProc

`defproc` is a pointer to the file transfer tool's main definition procedure, which is contained in a code resource of type `'fdef'`.

config

`config` is a pointer to a data block that is private to the file transfer tool. It can contain information like retry and timeout values, but the contents vary from tool to tool.

Your application can store the contents of `config` to save the state of a file transfer in a document. The structure, size, and contents of the configuration record are set by the tool. Your application can determine the size of the configuration record by calling `GetPtrSize`, overwrite its contents using `BlockMove`, and validate the contents with `FTValidate`.

Your application can use `FTGetConfig` and `FTSetConfig` to manipulate fields in this record. For details, read "Interfacing with a Scripting Language," later in this chapter.
You can find a description of `config` from a file transfer tools perspective in Chapter 8.

oldConfig

`oldConfig` is a pointer to a data block that is private to the file transfer tool and contains the most recently saved version of `config`. Your application is responsible for setting `oldConfig` when the user saves a session document.

environsProc

`environsProc` is a pointer to a routine in your application that the file transfer tool calls to obtain a record describing the connection environment. For more information about `environsProc`, see "`environsProc`: Getting Connection Environment Information," later in this chapter.

reserved1 and **reserved2**

`reserved1` and `reserved2` are fields reserved for the File Transfer Manager. Your application must not use this field.

ftPrivate

`ftPrivate` is a pointer to a data block that is private to the file transfer tool. Your application must not use this field.

sendProc

`sendProc` is a pointer to a routine that your application uses to send data. This routine is discussed under "`sendProc`: Sending Data, " later in this chapter.

recvProc

`recvProc` is a pointer to a routine that your application uses to request data. This routine is discussed under "`recvProc`: Receiving Data," later in this chapter.

writeProc

`writeProc` is a pointer to a routine in your application that writes data to a file. If this field is `NIL`, the file transfer tool performs standard file operations (that is, writing to a disk). The file transfer tool checks this field to see if your application has a `writeProc` routine. If it does, the tool lets `writeProc` handle writing data.

This routine can be used to perform postprocessing upon a file being received, and is discussed under "`writeProc`: Writing Data," later in this chapter.

readProc

`readProc` is a pointer to a routine in your application that reads data from a file. If this field is `NIL`, the file transfer tool performs standard file operations (that is, reading data from a disk). The file transfer tool checks this field to see if your application has a `readProc` routine. If it does, the tool lets `readProc` handle reading data.

This routine can be used to perform preprocessing upon a file being sent, and is discussed under "`readProc`: Reading Data," later in this chapter.

owner

`owner` is a pointer to a window (or grafPort) relative to which the file transfer status dialog box is positioned. If this field is `NIL`, the file transfer tool will not display a file transfer status dialog box.

direction

`direction` is a field that indicates whether a file is being sent to or received from another entity. Your application passes this field as a parameter to `FTStart` (described later in this chapter). Valid values in this field are as follows:

```
CONST
        ftReceiving         =       0;
        ftTransmitting      =       1;
        ftFullDuplex        =       2;

TYPE
        FTDirection         =       INTEGER;
```

theReply

theReply is an SFReply data structure. The SFReply data structure should contain the reference number of the working directory of the default volume for files being sent or received. If a file is being sent, the data structure should also contain the name of the file to be sent. If a file is being received and your application has information about the filename (for example, from a scripting language), the data structure should contain the filename to be used. Otherwise, pass an empty string for theReply.filename.

writePtr, readPtr, theBuf, and bufSize

writePtr, readPtr, theBuf, and bufSize are properties of a particular file transfer tool.

autoRec

autoRec is a string that represents the start sequence a remote entity sends, causing the Macintosh to enter a file-reception mode. If this string is of length 0, remote-entity-initiated file transfers are not supported by the file transfer tool. It is the application's responsibility to make use of this field by searching the data stream for this sequence of characters. The Connection Manager, described in Chapter 3, provides routines that your application can use to search an incoming data stream for a specified sequence of characters.

attributes

attributes is a field that describes the file transfer protocol supported by the file transfer tool. The bits in attributes are as follows:

```
CONST
        ftSameCircuit       =      $0001;
        ftSendDisable       =      $0002;
        ftReceiveDisable    =      $0004;
        ftTextOnly          =      $0008;

TYPE
        FTAttributes        =      INTEGER
```

ftSameCircuit indicates whether the file transfer tool creates its own data connection or expects the application to provide the connection. If this bit is set, the file transfer tool uses the data connection provided by the application. This bit is set by the file transfer tool.

ftSendDisable indicates that the file transfer tool does not allow users to send files. Some tools that support sending files turn this bit on when they are in a mode that does not allow users to initiate sending files. When this bit is on, your application should dim any menu items that allow users to send files.

ftReceiveDisable indicates that the file transfer tool does not allow users to receive files. Some tools that support receiving files turn this bit on when they are in a mode that does not allow users to initiate receiving files. When this bit is on, your application should dim any menu items that allow users to receive files.

ftTextOnly indicates that the file transfer tool sends and receives only text files (files of type TEXT); the tool does not handle resource forks. The file transfer tool sets this bit.

The other bits of this field are reserved by Apple Computer

File Transfer Manager routines

The following sections describe the routines that tools and applications can use to access File Transfer Manager services. Your application can not call these routines from interrupt level.

Below is a listing of the routines described in this section in the order in which they are presented.

Preparing for a file transfer

Before your application can start a file transfer, it must initialize the File Transfer Manager (by calling `initFT`), find out the `procID` of the tool it requires (by calling `FTGetProcID`), create a file transfer record (by calling `FTNew`), and then configure the file transfer tool (by restoring `config` from a saved document; or by calling `FTChoose`, the file transfer tool custom tool-settings routines, or `FTSetConfig`).

`InitFT`

Initializing the File Transfer Manager

`InitFT` initializes the File Transfer Manager. Your application must call this routine after calling the standard Macintosh Toolbox initialization routines.

▲ **Warning** Your application must initialize the Communications Resource Manager (by calling `InitCRM`) and then the Communications Toolbox Utilities (by calling `InitCTBUtilities`), regardless of whether or not it uses any of their calls, before it initializes the File Transfer Manager. ▲

Function `InitFT: FTErr;`

Description `InitFT` returns an operating-system error code if appropriate. Valid values are:

```
TYPE
     FTErr                =      OSErr;

CONST
     ftGenericError       =     -1;
     ftNoErr              =      0;
     ftNoTools            =      8;
```

Your application must check for the presence of the Communications Toolbox before calling this function. Sample code under "Determining Whether the Managers are Installed" in Appendix B shows you how your application can make this check.

FTGetProcID

Getting current `procID` information

Your application should call `FTGetProcID` just before creating a new file transfer record, to find out the `procID` of a tool.

Function

```
FTGetProcID(name: Str255): INTEGER;
```

Description

`name` specifies a file transfer tool. If there is a file transfer tool in the folder named *Communications Folder* with the specified `name`, this routine returns its `procID`. If `name` refers to a nonexistent file transfer tool, this routine returns –1.

FTNew

Creating a file transfer record

Before your application can transfer files, it must create a file transfer record. `FTNew` creates a new file transfer record, fills in the fields that it can, based upon the parameters that were passed to it; and returns a handle to the new record in `FTHandle`. `FTNew` automatically makes two calls to `FTDefault` (described later in this chapter) to fill in `config` and `oldConfig`. The File Transfer Manager then loads the file transfer tool's main definition procedure, moves it high in the current heap, and locks it. If an error occurs that prevents a new file transfer record from being created (for example, running out of memory), `FTNew` passes back `NIL` in `FTHandle`.

Function

```
FTNew(procID: INTEGER; flags: FTFlags; sendProc: ProcPtr;
recvProc: ProcPtr; readProc: ProcPtr; writeProc: ProcPtr;
environsProc: ProcPtr;  owner: WindowPtr; refCon: LONGINT;
userData: LONGINT): FTHandle;
```

Description

`procID` specifies the file transfer tool the File Transfer Manager will use to transfer data.

`flags` is a bit field with the following masks:

```
CONST
     ftIsFTMode   =     $0001;
     ftNoMenus    =     $0002;
     ftQuiet      =     $0004;
     ftSucc       =     $0080;

TYPE
     FTFlags      =     LONGINT;
```

`flags` represents a request from your application for a level of service. Your application can set only two of these bits, `ftNoMenus` and `ftQuiet`. If your application sets `ftNoMenus`, the file transfer tool will not display any custom menus. If your application sets `ftQuiet`, the file transfer tool will not display any windows. Applications typically use these bits to hide the file transfer tool from the user.

Apple Computer has reserved the bits of `flags` that are not shown in this document. Do not use them, or your code may not work in the future.

`ftSucc` is a bit that is set by the file transfer tool when a file transfer completes successfully.

Your application can check to see if `ftIsFTMode` toggles from on to off to find out when the file transfer has completed. Then it can check `ftSucc` to see if the file transfer was completed successfully.

`sendProc` is a pointer to a routine that the application uses to send data.

`recvProc` is a pointer to a routine that the application uses to request data.

`readProc` is a pointer to a routine in your application that reads data from a file. The file transfer tool checks this field to see if your application has a `readProc` routine. If it does, the tool lets `readProc` handle reading data. If `NIL`, the file transfer tool performs standard file operations (that is, reading data from a disk).

This function can be used to perform preprocessing upon a file being sent, and is discussed later in this chapter, in "Routines Your Application Provides."

`writeProc` is a pointer to a routine in your application that writes data to a file. The file transfer tool checks this field to see if your application has a `writeProc` routine. If it does, the tool lets `writeProc` handle writing data. If `NIL`, the file transfer tool performs standard file operations (that is, writing to a disk).

This function can be used to perform post-processing upon a file being received, and is discussed later in this chapter, in "Routines Your Application Provides."

`environsProc` is a pointer to a routine that the file transfer tool can call when it wants to get information about the connection. See Chapter 3 for more information about the `CMGetConnEnvirons` routine.

`owner` is a pointer to a window, relative to which the file transfer status dialog box is positioned. If this field is `NIL`, the File Transfer Manager will not display a file transfer status dialog box.

`refCon` and `userData` are fields that your application can use.

FTDefault

Initializing the file transfer record

FTDefault fills the specified configuration record with the default configuration specified by the file transfer tool. FTNew calls this procedure automatically when it fills in the config and oldConfig fields in a new file transfer record.

Procedure

```
FTDefault(VAR theConfig: Ptr; procID: INTEGER; allocate:
BOOLEAN);
```

Description

If allocate is TRUE, the tool allocates space for theConfig in the current heap zone.

FTValidate

Validating the file transfer record

FTValidate performs an internal consistency check on the configuration and private data records of the file transfer record. FTNew and FTSetConfig call this routine after they have created a new file transfer record, to make sure that the the record contains values identical to those specified by the file transfer tool.

Function

```
FTValidate(hFT: FTHandle): BOOLEAN;
```

Description

If the validation fails, the File Transfer Manager returns TRUE and the file transfer tool fills the configuration record with default values by calling FTDefault.

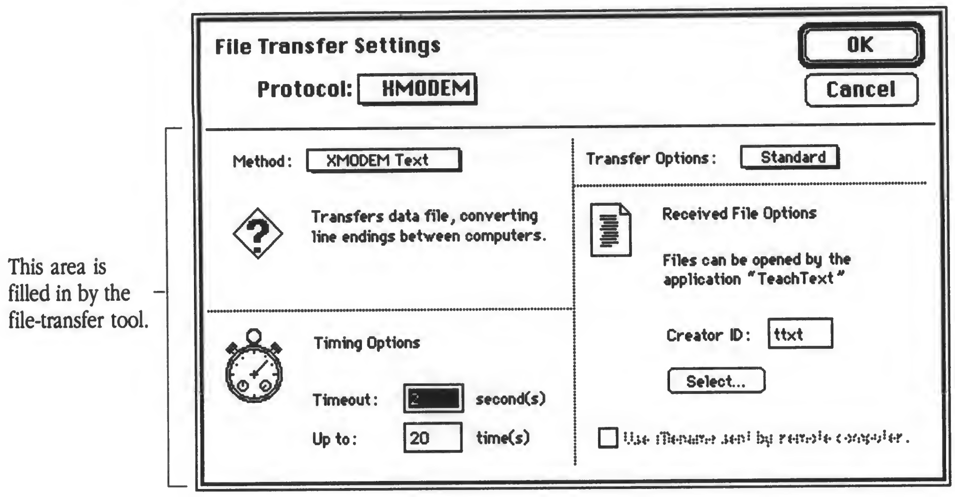
Your application can call this routine after restoring a configuration, to verify that the file transfer record contains the correct information, in a manner similar to that shown next.

```
BlockMove(saveConfig,hFT^^.config,GetPtrSize(hFT^^.config));
IF FTValidate(hFT) THEN BEGIN
    { validate failed }
    END
    ELSE BEGIN
           { validate succeeded }
           END
```

Configuring a file transfer tool

An application can configure a file transfer tool in one of three ways. The easiest and most straightforward way is by calling the `FTChoose` routine. This routine presents the user with a dialog box similar to the one shown in *Figure 5-2.*

■ **Figure 5-2** The standard tool-settings dialog box



File Transfer Settings

Protocol: XMODEM

Method: XMODEM Text

Transfers data file, converting line endings between computers.

Timing Options

Timeout: 2 second(s)

Up to: 20 time(s)

Transfer Options: Standard

Received File Options

Files can be opened by the application "TeachText"

Creator ID: ttxt

☐ Use filename sent by remote computer.

The second way an application can configure a file transfer tool is by presenting the user with a custom tool-settings dialog box. This method is much more difficult and involves calling six routines. The routines are described in the next section, "Custom Configuration of a File Transfer Tool," and "The Custom Tool-Settings Dialog Box" in Appendix B provides example code.

The third way your application can configure a file transfer tool is by using the scripting language interface, described under "Interfacing with a Scripting Language," later in this chapter. This method allows your application to bypass user interface elements.

Function

```
FTChoose(VAR hFt:FTHandle; where: Point; idleProc: ProcPtr):
INTEGER;
```

Description

`where` is the point, specified in global coordinates, where the upper-left corner of the dialog box should appear. It is recommended that your application place the dialog box as close as possible to the upper-left corner of the screen, because the size of the dialog box varies from tool to tool.

`idleProc` is a procedure with no parameters that the File Transfer Manager will automatically call every time `FTChoose` loops through the setup dialog filter procedure. Pass `NIL` if your application has no `idleProc`.

`FTSetupSetup`

Setting up tool-settings dialog box items

`FTSetupSetup` tells the file transfer tool to set up controls (like radio buttons or check boxes) in the dialog item list returned by `FTSetupPreflight`.

Procedure

```
FTSetupSetup(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR magicCookie: LONGINT);
```

Description

`procID` is the ID for the file transfer tool being configured. Your application should use the same value for `procID` as it passed to `FTSetupPreflight`.

`theConfig` is a pointer to a configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box in which configuration is taking place.

`magicCookie` is a pointer to private storage for the file transfer tool.

`FTSetupFilter`

Filtering tool-settings dialog box events

Your application calls `FTSetupFilter` as a filter procedure before it calls the standard modal dialog box filter procedure for the tool-settings dialog box. This routine allows file transfer tools to filter events in the tool-settings dialog box.

Function

```
FTSetupFilter(procID: INTEGER; theConfig: Ptr; count:INTEGER;
theDialog: DialogPtr; VAR theEvent: EventRecord; VAR theItem:
INTEGER; VAR magicCookie: LONGINT): BOOLEAN;
```

Description

If the event passed-in was handled, `FTSetupFilter` returns `TRUE`. `FALSE` indicates that your application should perform standard dialog box filtering.

`procID` is the ID for the file transfer tool that is being configured. Your application should use the same value for `procID` as it passed to `FTSetupPreflight`.

`theConfig` is the pointer to the configuration record for the tool being configured.

`count` is the number of the first item in the dialog item list appended to the dialog box.

`theDialog` is the dialog box performing the configuration.

`theEvent` is the event record for which filtering is to take place.

`theItem` can return the item clicked in the dialog box.

`magicCookie` is a pointer to private storage for the file transfer tool.

FTSetupItem

Processing tool-settings dialog box events

FTSetupItem processes events for controls in the custom tool-settings dialog box.

Procedure

```
FTSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie:
LONGINT);
```

Description

procID is the ID for the file transfer tool being configured. Your application should use the same value for procID as it passed to FTSetupPreflight.

theConfig is a pointer to the configuration record for the tool being configured.

count is the number of the first item in the dialog item list appended to the dialog box.

theDialog is the dialog box performing the configuration.

theItem is the item clicked in the dialog box. This value can be modified and sent back.

magicCookie is a pointer to private storage for the file transfer tool.

FTSetupCleanup

Performing clean-up operations

FTSetupCleanup disposes of any storage allocated in FTSetupPreflight and performs other clean-up operations.

Procedure

```
FTSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER;
theDialog: DialogPtr; VAR magicCookie: LONGINT);
```

Description

procID is the ID for the file transfer tool that is being configured. Your application should use the same value for procID as it passed to FTSetupPreflight.

theConfig is the pointer to the configuration record for the tool being configured.

count is the number of the first item in the dialog item list appended to the dialog box.

theDialog is the dialog box performing the configuration.

magicCookie is a pointer to private storage for the file transfer tool.

Closing the tool file

`FTSetupPostflight` closes the tool file if it is not being used by any session.

Procedure `FTSetupPostflight(procID:INTEGER);`

Description `procID` is the ID for the file transfer tool that is being configured. Your application should use the same value for `procID` as it passed to `FTSetupPreflight`.

Interfacing with a scripting language

Your application does not have to rely on users making selections from dialog boxes in order to configure a file transfer tool. `FTGetConfig` and `FTSetConfig` provide the services that your application needs to interface with a scripting language.

`FTGetConfig`

Getting the configuration string

`FTGetConfig` gets a configuration string from the file transfer tool.

Function `FTGetConfig(hFT: FTHandle): Ptr;`

Description `FTGetConfig` returns a null-terminated, C-style string from the file transfer tool containing tokens that fully describe the configuration of the file transfer record. For an example, see the description of the next routine. If an an error occurs, `FTGetConfig` returns `NIL`.

It is the responsibility of your application to dispose of `Ptr`.

`FTSetConfig`

Setting the configuration with a string

`FTSetConfig` passes a configuration string to the file transfer tool.

Function `FTSetConfig(hFT: FTHandle; thePtr: Ptr): INTEGER;`

Description `FTSetConfig` passes a null-terminated, C-style string (see the example string later in this section) to the file transfer tool for parsing. The string is pointed to by `thePtr` and must contain tokens that describe the configuration of the file transfer record. The string can be any length.

`FTSetConfig` ignores items it does not recognize or find relevant; such an occurrence causes the file transfer tool to stop parsing the string and to return the character position where the error occurred. If the file transfer tool successfully parses the string, it returns `ftNoErr`. If the file transfer tool does not successfully parse the string, it returns one of the following values: a number less than –1 to indicate an `OSErr`, –1 to indicate an unknown error, or a positive number to indicate the character position where parsing was stopped.

Individual file transfer tools are responsible for the parsing operation.

Sample *A null-terminated, C-style configuration string*

```
InterCharDelay 0 InterLineDelay 0 WordWrap False
Ending CR\0
```

Transferring files

When your application has performed the necessary steps described in the previous sections, it is ready to start transferring files. Your application must perform two steps: first, it must call `FTStart` to open the file and initialize tool-private variables; second, it must call `FTExec` to process data every time it goes through its main event loop.

`FTStart`

Starting a file transfer

`FTStart` opens the file that is going to be involved in the file transfer, and initializes tool-private variables.

The value in the `owner` field in the file transfer record controls the appearance of a status dialog box.

The code that performs the actual sending, receiving, reading, and writing of data is the responsibility of your application. Your application specifies these routines when it creates the file transfer record. For a description of the parameters that will be passed to these routines, see "Routines Your Application Provides," later in this chapter.

Function

```
FTStart(hFT: FTHandle; direction:FTDirection;
fileInfo:SFReply): FTErr;
```

Description

`direction` describes the direction of the file transfer and can be either `ftReceiving`, `ftTransmitting`, or `ftFullDuplex`.

Once the file transfer has started, your application needs to call `FTExec` every time it goes through its main event loop. Calling `FTExec` gives the tool time to send and receive a packet of data, amongst other things.

FTExec

Processing file transfer data

`FTExec` is the soul of the file transfer process because it allows the file transfer tool to implement the file transfer protocol. `FTExec` handles the disk input and output, either through your application or by performing local disk input and output, if specified by your application. Every time your application calls `FTExec`, a little piece of data is processed until there is no more data.

When sending files, the file transfer tool reads data from your application with `readProc`, and sends it to the connection with `sendProc`. When receiving files, the file transfer tool gets data from your application with `recvProc`, and checks if the data arrived correctly. The file transfer tool then writes the data with `writeProc`.

`readProc`, `sendProc`, `recvProc`, and `writeProc` are discussed in "Routines Your Application Provides" later in this chapter.

At the end of the file transfer, the file transfer tool is responsible for closing the file, releasing any memory allocated, and resetting the `ftIsFTMode` bit in the file transfer record.

Procedure

```
FTExec(hFT:  FTHandle);
```

FTAbort

Stopping a file transfer

`FTAbort` aborts a file transfer in progress. The file transfer tool sends the appropriate canceling characters to the remote computer, and stops the file transfer.

Function

```
FTAbort(hFT:  FTHandle):  FTErr;
```

FTDispose

Disposing of a file transfer record

`FTDispose` disposes of the file transfer record and all associated data structures. The file transfer tool stops any file transfer in progress (as specified by the file transfer record).

Procedure

```
FTDispose(hFT:  FTHandle);
```

`FTChoose` returns one of the following values:

```
CONST
    chooseDisaster      =     -2;
    chooseFailed        =     -1;
    chooseOKMinor       =      1;
    chooseOKMajor       =      2;
    chooseCancel        =      3;
```

`chooseDisaster` means that the `FTChoose` operation failed, destroyed the file transfer record, and returned `NIL` in the file transfer handle.

`chooseFailed` means that the `FTChoose` operation failed and the file transfer record was not changed.

`chooseOKMinor` means that the user clicked OK in the dialog box, but did not change the file transfer tool being used.

`chooseOKMajor` means that the user clicked OK in the dialog box and also changed the file transfer tool being used. The old file transfer handle is destroyed by the File Transfer Manager, by calling `FTDispose`. The file transfer is closed down, all pending read and write operations are terminated, and a new file transfer handle is returned in `hFT`.

`chooseCancel` means that the user clicked Cancel in the dialog box.

Custom configuration of a file transfer tool

Your application creates a custom tool-settings dialog box and presents it to the user by using six File Transfer Manager routines: `FTSetupPreflight`, `FTSetupSetup`, `FTSetupItem`, `FTSetupFilter`, `FTSetupCleanup`, and `FTSetupPostflight`. Using these routines is more involved than calling `FTChoose`, but they provide your application with much more flexibility. Refer to the code sample in "The Custom Tool-Settings Dialog Box" in Appendix B to see how an application calls these routines.

To build a list of file transfer tools, use the routine `CRMGetIndToolName`, which is described in Chapter 6.

`FTSetupPreflight`

Setting up the tool-settings dialog box

`FTSetupPreflight` returns a handle to a dialog item list that your application appends to the tool-settings dialog box. The handle comes from the file transfer tool. (The calling application uses `AppendDITL`, discussed in Chapter 7.) This handle is not a resource handle. Your application is responsible for disposing of the handle when done with it.

The file transfer tool can use `FTSetupPreflight` to allocate a block of private storage, and to store the pointer to that block in `magicCookie`. `magicCookie` should be passed to the other routines that are used to set up the tool-settings dialog box.

Function

```
FTSetupPreflight(procID: INTEGER; VAR magicCookie: LONGINT):
Handle;
```

Description

`procID` is the ID for the file transfer tool that is being configured. Your application should get this value by using the `FTGetProcID` routine, discussed earlier in this chapter.

◆ *Note:* The `refcon` of the custom tool-settings dialog box should point to a data structure (an example of which is shown next) in which the first two bytes are the tool `procID` and the next four bytes are `magicCookie`. `UserItem` routines, for example, may require `procID` to obtain tool resources.

```
TYPE
    chooseDLOGdata=RECORD
            procID:INTEGER
            magicCookie:LONGINT
END;
```

Handling events

The File Transfer Manager event-processing routines provide useful extensions to the Macintosh Toolbox Event Manager. This section explains the three procedures that the Communications Toolbox provides: `FTActivate`, `FTResume`, and `FTEvent`. See "Other Events" in Chapter 2 for sample code showing how an application can determine if an event needs to be handled by one of these routines.

`FTActivate`

Activate events

`FTActivate` processes an activate or deactivate event (for instance, installing or removing a custom tool menu) for a window associated with the file transfer.

Procedure

```
FTActivate(hFT: FTHandle; activate: BOOLEAN);
```

Description If `activate` is `TRUE`, the file transfer tool processes an activate event. Otherwise, it processes a deactivate event.

`FTResume`

Resume events

`FTResume` is called when your application receives a suspend or a resume event. The file transfer tool may decide to change timeout values or other parameters, depending on whether or not the application is running in the foreground.

Procedure

```
FTResume(hFT: FTHandle; resume: BOOLEAN);
```

Description If `resume` is `TRUE`, the file transfer tool processes a resume event. Otherwise, it processes a suspend event.

Menu events

Your application must call `FTMenu` when the user chooses an item from a menu installed by the file transfer tool.

Function

```
FTMenu(hFT: FTHandle; menuID: INTEGER; item: INTEGER): BOOLEAN;
```

Description `FTMenu` returns `FALSE` if the file transfer tool did not handle the menu event. `FTMenu` returns `TRUE` if the file transfer tool did handle the menu event.

Other events

When your application receives an event, it should check if the `refcon` of the window is a tool's `hFT`. Such an event occurs, for example, when the user clicks a button in a dialog box displayed by the file transfer tool. If it does belong to a file transfer tool's window, your application can call `FTEvent`.

Procedure

```
FTEvent(hFT: FTHandle; theEvent: EventRecord);
```

Description A window (or dialog box) created by a file transfer tool has a file transfer record handle stored in the `refCon` field for `windowRecord`.

Localizing configuration strings

The Communications Toolbox provides two routines that make it easier to localize configuration strings.

`FTIntlToEnglish`

Translating into English

`FTIntlToEnglish` converts a configuration string, which is pointed to by `inputPtr`, to an American English configuration string pointed to by `outputPtr`.

Function

```
FTIntlToEnglish(hFT: FTHandle; inputPtr: Ptr; VAR outputPtr:
Ptr; language: INTEGER): OSErr;
```

Description

This function returns an operating-system error code if any internal errors occur.

The file transfer tool allocates space for `outputPtr`. Your application is responsible for disposing of the pointer with `DisposPtr` when done with it.

`language` specifies the language from which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, this routine returns `noErr`, but `outputPtr` is `NIL`.

`FTEnglishToIntl`

Translating from English

`FTEnglishToIntl` converts an American English configuration string, which is pointed to by `inputPtr`, to a configuration string pointed to by `outputPtr`.

Function

```
FTEnglishToIntl(hFT: FTHandle; inputPtr: Ptr; VAR outputPtr:
Ptr; language: INTEGER): OSErr;
```

Description

This function returns an operating-system error code if any internal errors occur.

The file transfer tool allocates space for `outputPtr`; your application is responsible for disposing of the pointer with `DisposPtr` when done with it.

`language` specifies the language to which the string is to be converted. Valid values for this field are shown in the description of the Script Manager in *Inside Macintosh,* Volume V. If the language specified is not supported, `noErr` is still returned, but `outputPtr` is `NIL`.

Miscellaneous routines

The routines described in this section perform a variety of tasks.

`FTGetToolName`

Getting the name of a tool

`FTGetToolName` returns in `name` the name of the tool specified by `procID`.

Procedure `FTGetToolName(procID: INTEGER; VAR name: Str255);`

Description If `procID` references a file transfer tool that does not exist, the File Transfer Manager sets `name` to an empty string.

`FTSetRefCon`

Setting the file transfer record's reference constant

`FTSetRefCon` sets the file transfer record `refCon` to the given value. It is very important that your application use this routine to change the value of the reference constant, instead of changing it directly.

Procedure `FTSetRefCon(hFT: FTHandle; refCon: LONGINT);`

`FTGetRefCon`

Getting the file transfer record reference constant

`FTGetRefCon` returns the file transfer record reference constant.

Function `FTGetRefCon(hFT: FTHandle): LONGINT;`

FTSetUserData

Setting the `userData` field

`FTSetUserData` sets the file transfer record's `userData` field to the given value. It is very important that your application use this routine to change the value of the `userData` field, instead of changing it directly.

Procedure

```
FTSetUserData(hFT: FTHandle; userData: LONGINT);
```

FTGetUserData

Getting the `userData` field

`FTGetUserData` returns the file transfer record's `userData` field.

Function

```
FTGetUserData(hFT: FTHandle) : LONGINT;
```

FTGetVersion

Getting `'vers'` resource information

`FTGetVersion` returns a handle to a relocatable block that contains the information in the file transfer tool's `'vers'` resource with ID=1. Your applications is responsible for disposing of the handle when done with it.

◆ *Note:* The handle returned is *not* a resource handle.

Function

```
FTGetVersion(hFT: FTHandle): Handle;
```

FTGetFTVersion

Getting the File Transfer Manager version number

`FTGetFTVersion` returns the version number of the File Transfer Manager.

Function

```
FTGetFTVersion: INTEGER;
```

Description

The version number of the File Transfer Manager described in this document is:

```
CONST
    curFTVersion =      1;
```

Routines your application provides

Your application is responsible for providing routines it will use to send, receive, read, and write data during a file transfer. Your application might also need to include a routine that can provide information to the file transfer tool about the connection environment. When your application creates a new file transfer record, it specifies pointers to these routines.

Sending and receiving files are both two-step processes. When sending a file, the file transfer tool calls `readProc` to read the data into a buffer, and then `sendProc` to send the processed data. When receiving a file, the file transfer tool calls `recvProc` to get the data, and then `writeProc` to write the processed data to the appropriate medium.

Your application must include the send and receive routines described in this section. The other routines are optional.

`readProc`

Reading data

`readProc` is a routine in your application that the file transfer tool calls to read data into a buffer.

Function

```
readProc(VAR count: LONGINT; bufPtr: Ptr; refCon: LONGINT):
OSErr;
```

Description

`readProc` must return an error code when appropriate.

`count` is the number of bytes to read into the buffer. After `readProc` has completed, `count` contains the actual number of bytes that were read.

`bufPtr` points to the buffer into which the data was read.

`refCon` is the reference constant of the file transfer record.

Sending data

`sendProc` is a routine in your application that the file transfer tool calls to send data that is in a buffer.

Function

```
sendProc(thePtr: Ptr; theSize: LONGINT; refCon: LONGINT;
channel: CMChannel; flags: CMFlags):LONGINT;
```

Description

`sendProc` must return the actual number of bytes it sent.

`thePtr` is a pointer to a block of data in memory that is to be sent.

`theSize` is the length of that block.

`refCon` is the reference constant of the file transfer record.

`channel` specifies the channel that the file transfer tool can use. Your application should specify one of the following values for channel: `CMData`, `CMCntl`, or `CMAttn`.

`flags` is described in Chapter 3 under the description of `CMWrite`.

Sample send routine

```
FUNCTION sendProc(thePtr: Ptr;theSize: LONGINT;refcon: LONGINT;
                channel: CMChannel;flags: INTEGER) : LONGINT;
VAR
    theErr : CMErr;                 { Errors on a write }

BEGIN
    sendProc:= 0;                   { Assume the worst }

    IF gConn <> NIL THEN BEGIN      { Send the data }
        theErr := CMWrite(gConn,thePtr,theSize,channel,FALSE, NIL, 0, flags);
        IF (theErr = noErr) THEN
            sendProc:= theSize      { if ok, we sent all }
        ELSE
            ;                       { Handle errors }
    END; { Good Connection    }

END; { sendProc }
```

Receiving data

`recvProc` is a routine in your application that the file transfer tool uses to receive data into a buffer from the connection.

Function

```
recvProc(thePtr: Ptr; theSize: LONGINT; refCon: LONGINT;
channel: CMChannel; VAR flags: CMFlags):LONGINT;
```

Description

`recvProc` must return the actual number of bytes it received.

`thePtr` is a pointer to a block of data in memory where the incoming data is to be placed.

`theSize` is the length of that data.

`refCon` is the reference constant of the file transfer record.

`channel` specifies the data channel that the file transfer tool can use. Your application should specify one of the following values for channel: `cmData`, `cmCntl`, or `cmAttn`.

`flags` is described in Chapter 3 under the description of `CMRead`.

Sample receive routine

```
FUNCTION recvProc(thePtr: Ptr;theSize: LONGINT;refcon: LONGINT;
                    channel: CMChannel;VAR flags: INTEGER): LONGINT;
VAR
    theErr  : CMErr;            { Any errors }

BEGIN
    recvProc:= 0;               { Assume the worst }

    IF gConn <> NIL THEN BEGIN
                                { Read all the data }
        theErr  := CMRead(gConn,thePtr,theSize,channel,FALSE,NIL,0,flags);
        IF (theErr <> noErr) THEN
            recvProc:= theSize  { if ok, we got all }
        ELSE
            ;                   { Handle errors }
    END; { Good Connection }

END; { recvProc }
```

`writeProc`

Writing data

`writeProc` is a routine in your application that the file transfer tool uses to write data from a buffer.

Function

```
writeProc(VAR count: LONGINT; bufPtr: Ptr; refCon: LONGINT):
OSErr;
```

Description

`writeProc` must return an error code when appropriate.

`count` is the number of bytes to write. After `writeProc` has completed, `count` contains the actual number of bytes written.

`bufPtr` is a pointer to the data in memory.

`refCon` is the reference constant of the file transfer record.

`environsProc`

Getting the connection environment

Sometimes the file transfer tool needs to know about the type of connection on which to transfer files. For example, some file transfer protocols require an 8-bit data channel. To get this information, the file transfer tool calls a routine in your application, `environsProc`.

Function

```
environsProc(refCon: LONGINT; VAR theEnvirons: ConnEnvironRec):
CMErr;
```

Description

`refCon` is the reference constant of the file transfer record.

`theEnvirons` is a data structure containing the connection-environment record. Your application can either construct `theEnvirons` or use the Connection Manager routine `CMGetConnEnvirons`. For more information about `theEnvirons`, see "`CMGetConnEnvirons`: Getting the Connection Environment" in Chapter 3.

The example that follows shows how `environsProc` can point to a Connection Manager routine to retrieve information about the connection environment.

Sample connection-environment routine

```
FUNCTION environsProc(refCon: LONGINT;VAR theEnvirons: ConnEnvironRec): OSErr;
BEGIN
    environsProc:= envNotPresent;    { pessimism }

    { Get the connection info }
    IF gConn <> NIL THEN             { Tool sets the version }
        environsProc:= CMGetConnEnvirons(gConn,theEnvirons);

END; { environsProc }
```

Quick reference

This section provides a reference to File Transfer Manager routines and data structures. At the end of this section is a listing of routine selectors for programming in assembly language.

Routines

File Transfer Manager routines	*See page*
`FTAbort(hFT: FTHandle): FTErr;`	*150*
`FTActivate(hFT: FTHandle; activate: BOOLEAN);`	*151*
`FTChoose(VAR hFT: FTHandle; where: Point; idleProc: ProcPtr): INTEGER;`	*142*
`FTDefault(VAR theConfig: Ptr; procID: INTEGER; allocate: BOOLEAN);`	*141*
`FTDispose(hFT: FTHandle);`	*150*
`FTEnglishToIntl(hFT: FTHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*153*
`FTEvent(hFT: FTHandle; theEvent: EventRecord);`	*152*
`FTExec(hFT: FTHandle);`	*150*
`FTGetConfig(hFT: FTHandle): Ptr;`	*148*
`FTGetFTVersion: INTEGER;`	*155*
`FTGetToolName(procID: INTEGER; VAR name: Str255);`	*155*
`FTGetProcID(name: Str255): INTEGER;`	*139*
`FTGetRefCon(hFT: FTHandle): LONGINT;`	*154*
`FTGetUserData(hFT: FTHandle) : LONGINT;`	*155*
`FTGetVersion(hFT: FTHandle): Handle;`	*155*
`FTIntlToEnglish(hFT: FTHandle; inputPtr: Ptr; VAR outputPtr: Ptr; language: INTEGER): OSErr;`	*153*
`FTMenu(hFT: FTHandle; menuID: INTEGER; item: INTEGER): BOOLEAN;`	*152*
`FTNew(procID: INTEGER; flags: FTFlags; sendProc: ProcPtr; recvProc: ProcPtr; readProc: ProcPtr; writeProc: ProcPtr; environsProc: ProcPtr; owner: WindowPtr; refCon: LONGINT; userData: LONGINT): FTHandle;`	*139*
`FTResume(hFT: FTHandle; resume: BOOLEAN);`	*151*
`FTSetConfig(hFT: FTHandle; thePtr: Ptr): INTEGER;`	*148*
`FTSetRefCon(hFT: FTHandle; refCon: LONGINT);`	*154*

File Transfer Manager routines	*See page*
`FTSetupCleanup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*146*
`FTSetupFilter(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR theEvent: EventRecord; VAR theItem: INTEGER; VAR magicCookie: LONGINT): BOOLEAN;`	*145*
`FTSetupItem(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR theItem: INTEGER; VAR magicCookie: LONGINT);`	*146*
`FTSetupPostflight(procID:INTEGER);`	*147*
`FTSetupPreflight(procID: INTEGER; VAR magicCookie: LONGINT): Handle;`	*144*
`FTSetupSetup(procID: INTEGER; theConfig: Ptr; count: INTEGER; theDialog: DialogPtr; VAR magicCookie: LONGINT);`	*145*
`FTSetUserData(hFT: FTHandle; userData: LONGINT);`	*155*
`FTStart(hFT: FTHandle; direction: FTDirection; fileInfo: SFReply): FTErr;`	*149*
`FTValidate(hFT: FTHandle): BOOLEAN;`	*141*
`InitFT: FTErr;`	*138*

Routines in your application	*See page*
`environsProc(refCon: LONGINT; VAR theEnvirons: ConnEnvironRec): CMErr;`	*159*
`readProc(VAR count: LONGINT; bufPtr: Ptr; refCon: LONGINT):OSErr;`	*156*
`recvProc(thePtr: Ptr; theSize: LONGINT; refCon: LONGINT; channel: CMChannel; VAR flags: CMFlags):LONGINT;`	*158*
`sendProc(thePtr: Ptr; theSize: LONGINT; refCon: LONGINT; channel: CMChannel; flags: CMFlags):LONGINT;`	*157*
`writeProc(VAR count: LONGINT; bufPtr: Ptr; refCon: LONGINT): OSErr;`	*159*

File transfer record

```
TYPE
      FTHandle          =      ^FTPtr;
      FTPtr             =      ^FTRecord;
      FTRecord          =      PACKED  RECORD

            procID      :      INTEGER;


            flags       :      FTFlags;
            errCode     :      FTErr;

            refCon      :      LONGINT;
            userData    :      LONGINT;

            defProc     :      ProcPtr;

            config      :      Ptr;
            oldConfig   :      Ptr;

            environsProc :     ProcPtr;
            reserved1   :      LONGINT;
            reserved2   :      LONGINT;

            ftPrivate   :      Ptr;

            sendProc    :      ProcPtr;
            recvProc    :      ProcPtr;
            writeProc   :      ProcPtr;
            readProc    :      ProcPtr;

            owner       :      WindowPtr;

            direction   :      FTDirection;
            theReply    :      SFReply;

            writePtr    :      LONGINT;
            readPtr     :      LONGINT;
            theBuf      :      ^char;
            bufSize     :      LONGINT;
            autoRec     :      Str255;
            attributes  :      FTAttributes;
      END;
```

Constants and data types

```
CONST
       curFTVersion        =      1;

TYPE
       FTDirection         =      INTEGER;

CONST
       ftReceiving         =      0;
       ftTransmitting      =      1;
       ftFullDuplex        =      2;


{ file transfer attributes }
TYPE
       FTAttributes        =      INTEGER
CONST
       ftSameCircuit       =      $0001;
       ftSendDisable       =      $0002;
       ftReceiveDisable    =      $0004;
       ftTextOnly          =      $0008;


{ file transfer flags }
TYPE
       FTFlags             =      LONGINT;

CONST
       ftIsFTMode          =      $0001;
       ftNoMenus           =      $0002;
       ftQuiet             =      $0004;
       ftSucc              =      $0080;

{ Choose return values }
CONST
       chooseDisaster      =      -2;
       chooseFailed        =      -1;
       chooseOKMinor       =       1;
       chooseOKMajor       =       2;
       chooseCancel        =       3;
```

Errors

```
TYPE
        FTErr               =       OSErr;

CONST
        ftGenericError      =       -1;
        ftNoErr             =        0;
        ftRejected          =        1;
        ftFailed            =        2;
        ftTimeOut           =        3;
        ftTooManyRetry      =        4;
        ftNotEnoughDspace   =        5;
        ftRemoteCancel      =        6;
        ftWrongFormat       =        7;
        ftNoTools           =        8;
        ftUserCancel        =        9;
        ftNotSupported      =       10;
```

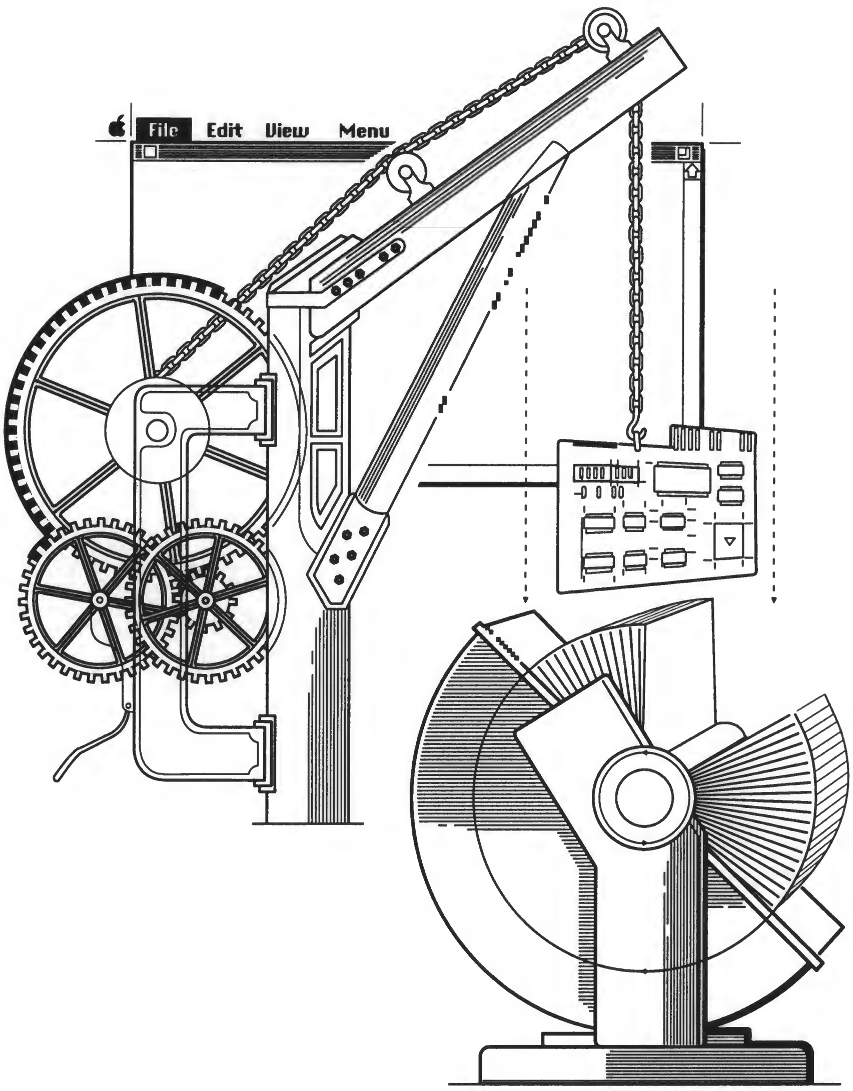
File Transfer Manager routine selectors

◆ *Assembly note:* The Communications Toolbox routines are accessed via a Macintosh Operating System trap. `A0` contains a pointer to the routine parameters. You can call each of the Communications Tooolbox routines with a macro that has the same name as the routine preceded by an underscore. When expanded, these macros put the routine selector onto the stack, set `A0` to point to the selector, invoke the trap macro `_ComToolTrap ($A08B)`, and finally pop the routine selector back off the stack. It is your application's responsibility to remove the parameters.

FTAbort	.EQU	525	FTGetProcID	.EQU	519
FTActivate	.EQU	544	FTGetRefCon	.EQU	515
FTChoose	.EQU	540	FTGetToolName	.EQU	518
FTDefault	.EQU	528	FTGetUserData	.EQU	517
FTDispose	.EQU	521	FTGetVersion	.EQU	538
FTEnglishToIntl	.EQU	537	FTIntlToEnglish	.EQU	536
FTEvent	.EQU	541	FTMenu	.EQU	543
FTExec	.EQU	522	FTNew	.EQU	520
FTGetConfig	.EQU	534	FTResume	.EQU	526
FTGetFTVersion	.EQU	539	FTSetConfig	.EQU	535

```
FTSetRefCon         .EQU    514         FTSetupSetup       .EQU    530
FTSetupCleanup      .EQU    533         FTSetUserData      .EQU    516
FTSetupFilter       .EQU    531         FTStart            .EQU    523
FTSetupItem         .EQU    532         FTValidate         .EQU    527
FTSetupPostflight   .EQU    542         InitFT             .EQU    513
FTSetupPreflight    .EQU    529
```

Chapter 6 **Communications Resource Manager**



THIS CHAPTER describes the Communications Resource Manager, the Communications Toolbox manager that makes it easier for your code to manage communications resources and devices. This chapter describes the data structures and routines your code can use to implement device management. Next, it presents the routines your code can use to perform resource management. At the end of the chapter, you'll find a "Quick Reference" to routines, data structures, and routine selectors for programming in assembly language.

In this chapter, the term *your code* refers to the application, tool, or driver you are writing for the Macintosh, which will implement communications services for users.

To use the Communications Resource Manager, you need to be familiar with

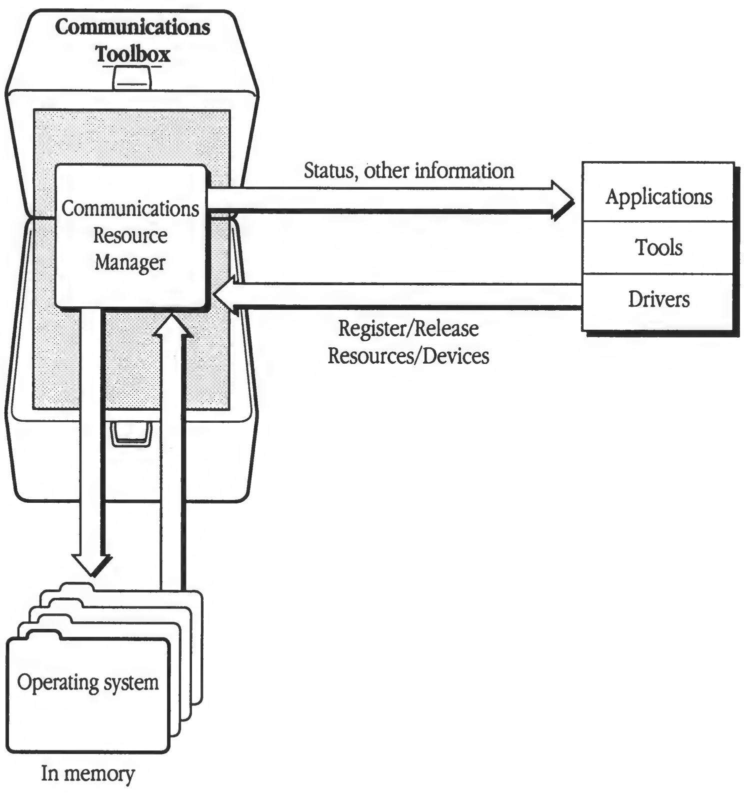
- the Resource Manager (described in *Inside Macintosh*, Volumes I, IV, V)
- the Device Manager (described in *Inside Macintosh*, Volumes I, IV, V)
- the Memory Manager (described in *Inside Macintosh*, Volumes I, IV, V)
- the Operating System Utilities (described in *Inside Macintosh*, Volume II)
- the MultiFinder programming environment (described in *Programmer's Guide to MultiFinder*)

About the Communications Resource Manager

Your code uses the services provided by the Communications Resource Manager for two purposes: to manage devices (such as internal modems and serial cards) and to manage resources. Device management is essential when your code needs to know about new cards that have been installed in a Macintosh. Resource management is required when your code is sharing resources with other applications (as it does when a Macintosh runs under MultiFinder). The resource management services provided by the Communications Resource Manager are an extension to the services provided by the Resource Manager in the Macintosh Toolbox.

The way your code uses the Communications Resource Manager is very similar to the way it uses other Communications Toolbox managers. Your code calls a Communications Resource Manager routine, which, upon completion, returns to your code any relevant parameters and return codes. *Figure 6-1* shows the data flow into and out of the Communications Resource Manager.

■ **Figure 6-1** Data flow into and out of the Communications Resource Manager


Communications Toolbox
Communications Resource Manager
Status, other information
Applications
Tools
Drivers
Register/Release Resources/Devices
Operating system
In memory

Device management

The way Macintosh applications interact with special interface cards varies from card to card, making the task of programming the Macintosh to use these cards quite complex. The Communications Toolbox solves this problem by providing applications with standardized routines and data structures that they can use to keep track of communications devices users have installed.

The data structure that is most important in supporting communications device management is the **communications resource record,** which is stored as an operating system queue. The communications resource record comprises fields containing information such as the type of device the record represents, and whether or not the device is available for use. The communications resource record is described later in this chapter.

The Communications Resource Manager and your code keep track of communications devices by placing a communications resource record into the queue for each communications device. Initially, when your code calls `InitCRM` (discussed later in this chapter), this queue contains two records, one for each of the serial drivers. Your code can then add and delete communications resource records.

By making use of Communications Toolbox routines, your code can register new devices, allocate devices, and look for specific kinds of devices. And device drivers, if properly coded, can resolve conflicts when two or more applications need to use a communications resource at the same time. This situation often arises in a MultiFinder environment.

Resource management

When your code shares resources with other applications, problems can arise if one of the applications accidentally disposes of a resource needed by another application. The Communications Toolbox provides routines that your code can use to share resources without confronting this kind of problem. These routines keep track of how many times a resource is simultaneously in use in an internal Communications Resource Manager data structure for every communications resource. Every time code requests a resource, the Communications Resource Manager *increases* the "use count" for that resource by 1. Every time code releases a communications resource, the Communications Resource Manager *decreases* the value by 1. This enables the Communications Resource Manager to keep track of which resources are being used; when a resource's use count reaches 0, it is released.

The communications resource record

The most important data structure to the Communications Resource Manager is the communications resource record. It contains information like the name and type of each device connected to the Macintosh, and whether or not a device is in use.

At startup time, the Communications Resource Manager builds a queue of communications resource records. If the Communications Resource Manager is installed, the queue will consist of a minimum of two devices of type `crmSerialDevice`.

When your code installs a new record into the queue, it must fill in the following fields in the communications resource record: `crmDeviceType`, `crmAttributes`, `crmStatus`, and `crmRefCon`. The Communications Resource Manager fills in the other fields.

Communications resource record data structure

```
TYPE
      CRMRecPtr              =     ^CRMRec;
      CRMRec                 =     RECORD
            qLink            :     QElemPtr;
            qType            :     INTEGER;
            crmVersion       :     INTEGER;

            crmPrivate       :     LONGINT;
            crmReserved      :     INTEGER;

            crmDeviceType    :     LONGINT;
            crmDeviceID      :     LONGINT;
            crmAttributes    :     LONGINT;
            crmStatus        :     LONGINT;

            crmRefCon        :     LONGINT;
      END;
```

qLink

`qLink` points to the next `CRMRec` in the Communications Resource Manager's queue of communications resource records.

qType

`qType` is a constant that your code must fill with the constant `crmType`.

crmVersion

`crmVersion` is the version number of the `CRMRec` data structure. At this time there is only one version, so the Communications Resource Manager fills this with the constant `crmRecVersion`.

`crmPrivate` and `crmReserved`

`crmPrivate` and `crmReserved` are private to the Communications Resource Manager; your code must not use them.

`crmDeviceType`

`crmDeviceType` is the type of device. For example, a serial port has a `crmDeviceType` of `crmSerialDevice`.

`crmDeviceID`

`crmDeviceID` is an identifier that your code can use to distinguish between multiple devices of the same device type. The Communications Resource Manager fills in this field when your code calls the `CRMInstall` routine.

`crmAttributes`

`crmAttributes` specifies the attributes of a specific device type. This field can hold either a pointer to the data or the actual data that describes the device. A sample `crmAttributes` data structure appears later in this chapter in the section "Registering a Device."

`crmStatus`

`crmStatus` specifies the status of a device. Your code can use this field for device arbitration purposes.

`crmRefCon`

`crmRefCon` is not used in this release of the Communications Resource Manager.

Communications Resource Manager routines

The following sections describe the routines that applications use to access Communications Resource Manager services. Your application can not call these routines from interrupt level.

Below is a listing of the routines described in this section in the order in which they are presented. You can use the list as a reference tool to find the description of a routine. Or, you can use the index at the end of this document, which lists these routines alphabetically.

Initializing the Communications Resource Manager

`InitCRM` initializes the Communications Resource Manager.

▲ **Warning** Your code must call this routine after calling the standard Macintosh Toolbox initialization routines and before calling any of the other Communications Toolbox manager initialization routines. ▲

Function `InitCRM:CRMErr;`

Description `InitCRM` returns an operating-system error code if appropriate. Valid values are as follows:

```
TYPE
     CRMErr              =     OSErr;

CONST
     crmGenericError     =     -1;
     crmNoErr            =      0;
```

Your code must check for the presence of the Communications Toolbox before calling this function. Sample code under "Determining Whether the Managers are Installed" in Appendix B shows you how your application can make this check.

Installing devices

`CRMInstall` installs a device into the Communications Resource Manager's queue. Devices in the Communications Resource Manager queue typically have their `CRMRec` records allocated in the system heap. If your code installs a `CRMRec` at startup time, be sure that your code increases the size of the system heap appropriately.

For more information on how to register a device with the Communications Resource Manager, read "Registering a Device," later in this chapter.

Procedure `CRMInstall(CrmReqPtr: QElemPtr);`

Description `CRMInstall` installs the communications resource record `crmReqPtr` into the Communications Resource Manager queue.

▲ **Warning** A `CRMRec` allocated in the application heap needs to be removed before the application heap is reinitialized; otherwise, the Communications Resource Manager queue may be damaged. ▲

CRMSearch

Searching for devices

Your code can use `CRMSearch` to order the Communications Resource Manager queue, or to add new elements to the end of the queue.

Function `CRMSearch(crmReqPtr: QElemPtr): QElemPtr;`

Description `crmReqPtr` specifies communications resource record search criteria.

`CRMSearch` searches for a device in the Communications Resource Manager queue that has two characteristics: the same `deviceType`, and a `deviceID` greater than the `deviceID` in the record specified by `crmReqPtr`. `CRMSearch` returns a pointer to the first record that it finds that meets these two conditions. Or, if no records meet the search criteria, it returns `NIL`.

When searching for the first element in the queue, your code must pass 0 in `deviceID`.

CRMRemove

Removing devices

`CRMRemove` removes a device from the Communications Resource Manager queue.

Function `CRMRemove(crmReqPtr: QElemPtr): OSErr;`

Description `crmReqPtr` specifies the device to be removed.

CRMGetCRMVersion

Getting the version number

`CRMGetCRMVersion` returns the version number of the Communications Resource Manager.

Function

```
CRMGetCRMVersion:INTEGER;
```

Description

The Communications Resource Manager version described in this document is:

```
CONST
     curCRMVersion        =      1;
```

CRMGetHeader

Getting to the head of the queue

`CRMGetHeader` returns a pointer to the head of the Communications Resource Manager queue.

Function

```
CRMGetHeader:  QHdrPtr;
```

Resource management routines

The nine routines described in this section make it easier for your code to manage communications resources. Your code should use these routines so that the Communications Resource Manager can keep track of how many times a resource is simultaneously in use.

The names of these routines are similar to the names of Resource Manager routines available in the Macintosh Toolbox. Communications Resource Manager routines also operate very much like Resource Manager routines; in fact, most of them make use of their counterparts in the Macintosh Toolbox.

`CRMGetResource` and `CRMGet1Resource`

Loading resources

`CRMGetResource` and `CRMGet1Resource` call the Resource Manager routines `GetResource` and `Get1Resource`, respectively, and return a handle to the specified communications resource. The Communications Resource Manager then adds the handle to the list of resources that it is managing, and increases by one use count, which indicates how many pieces of code are using a resource.

Function

```
CRMGetResource(theType: ResType; theID: INTEGER): Handle;
```

Function

```
CRMGet1Resource(theType: ResType; theID: INTEGER): Handle;
```

`CRMGetIndResource` and `CRMGet1IndResource`

Loading indexed resources

`CRMGetIndResource` and `CRMGet1IndResource` call the Resource Manager routines `GetIndResource` and `Get1IndResource`, respectively, and return a handle to the specified communications resource. The Communications Resource Manager then adds the handle to the list of resources that it is managing, and increases by one the use count, which indicates how many pieces of code are using a resource.

Function

```
CRMGetIndResource(theType: ResType; index: INTEGER): Handle;
```

Function

```
CRMGet1IndResource(theType: ResType; index: INTEGER): Handle;
```

CRMGetNamedResource and CRMGet1NamedResource

Loading named resources

`CRMGetNamedResource` and `CRMGet1NamedResource` call `GetNamedResource` and `Get1NamedResource`, respectively, and return a handle to the specified communications resource. The Communications Resource Manager then adds the handle to the list of resources that it is managing, and increases by one the use count, which indicates how many pieces of code are using a resource.

Function `CRMGetNamedResource(theType: ResType; name: Str255): Handle;`

Function `CRMGet1NamedResource(theType: ResType; name: Str255): Handle;`

CRMGetIndex

Getting a usage index for a resource

`CRMGetIndex` returns a use count which indicates how many pieces of code are simultaneously using a resource with the specified handle. `CRMGetIndex` returns 0 if it does not find `theHandle` in the list of resources the Communications Resource Manager is managing.

Function `CRMGetIndex(theHandle: Handle): LONGINT;`

CRMReleaseResource

Releasing resources

`CRMReleaseResource` decreases by 1 the value that indicates how many pieces of code have requested a resource. If the use count reaches 0, the resource specified by `theHandle` is released with a call to the Resource Manager routine `ReleaseResource`.

Procedure `CRMReleaseResource(theHandle: Handle);`

▲ **Warning** Your code must release communications resources by calling `CRMReleaseResource`. If your code tries to release the resources using the Resource Manager routine `ReleaseResource`, the results are unpredictable. ▲

Getting the name of a tool

`CRMGetIndToolName` returns the name of a tool in `toolName`.

Function

```
CRMGetIndToolName(bundleType : OSType; index : INTEGER; VAR
toolName : Str255) : OSErr;
```

Description

The appropriate values for `bundleType` are as follows:

```
CONST
     ClassCM       =      'cbnd';
     ClassFT       =      'fbnd';
     ClassTM       =      'tbnd';
```

`index` specifies which occurrence of a particular type of tool to return. For example, if `index` is 2, the Communications Resource Manager returns the name of the second tool of a particular type in `toolName`. If the Communications Resource Manager cannot find a tool that matches the specified parameters, an empty string is returned in `toolName`.

Resource-mapping routines

All resources used by a tool can be referenced by a local ID, which can be mapped (using the tool bundle resource) into the appropriate physical ID. The Communications Toolbox contains two routines that will help you keep things straight: To map from physical ID to local ID, use `CRMRealToLocalID`; to map from local ID to physical ID, use `CRMLocalToRealID`.

`CRMRealToLocalID`

Mapping to Local ID

`CRMRealToLocalID` maps a physical resource ID to a local resource ID.

Function `CRMRealToLocalID(bundleType: ResType; toolID: INTEGER; theKind: ResType; realID: INTEGER): INTEGER;`

Description This routine returns the (physical/local) resource ID if an appropriate entry exists in the tool bundle resource. If no entry is found, –1 is returned.

`bundleType` specifies the type of tool for which the mapping is to take place: `ClassCM` (for connection tools), `ClassTM` (for terminal tools), or `ClassFT` (for file transfer tools).

Here is the format for a connection tool bundle resource (in `Rez` format). The same resource type declaration holds for terminal tools and file transfer tools.

```
type 'cbnd' {                    /* or tbnd, or fbnd */
    integer = $$CountOf(TypeArray) - 1;
    array TypeArray {
        literal longint;    /* Type */
        integer = $$CountOf(IDArray) - 1;
        wide array IDArray {
            integer;        /* Local ID */
            integer;        /* Actual ID */
        };
    };
};
```

Mapping to Real ID

`CRMLocalToRealID` maps a local resource ID to a physical resource.

Function

```
CRMLocalToRealID(bundleType: ResType; toolID: INTEGER; theKind:
ResType; localID: INTEGER): INTEGER;
```

Description

This routine returns the (physical/local) resource ID if an appropriate entry exists in the tool bundle resource. If no entry is found, –1 is returned.

`bundleType` specifies the type of tool for which the mapping is to take place: `ClassCM` (for connection tools), `ClassTM` (for terminal tools), or `ClassFT` (for file transfer tools).

`toolID` specifies the bundle resource for the tool.

Registering a device

This section gives some basic information about writing drivers that emulate the behavior of the built-in serial drivers.

Private storage	Your code can reference all private data storage off the `dCtlStorage` field of the `DCtlEntry` for the drivers involved.
Low memory	Do not use any.
Driver naming	Use unique driver names and be prepared to deal with driver name collisions. For example, don't use `.cIn/.cOut`.
driver csCode calls	Support all of the `csCode` calls supported by the standard serial drivers. If you need additional `csCode` calls, contact Developer Technical Support to reserve them. `csCode` calls below 256 are reserved for Apple Computer

Data structures

Each device in the Communications Resource Manager's queue has a `CRMRec` associated with it. For the `crmDeviceType` field, Apple Computer, has defined the following value for serial port devices:

```
CONST
        crmSerialDevice      =      1;
```

◆ *Note:* Values for `crmDeviceType` less than 128 are reserved for Apple Computer Your code must not use them.

When adding a `CRMRec` to the Communications Resource Manager queue with the `CRMInstall` routine, pass 0 for the `crmDeviceID` field. The device identifier will be assigned by the Communications Resource Manager.

The `crmAttributes` field in the `CRMRec` points to a serial port device-specific data structure. The `crmStatus` field of the `CRMRec` is not used for devices of type `crmSerialDevice` in this version of the Communications Resource Manager.

```
TYPE
      CRMSerialPtr              =       ^CRMSerialRecord;
      CRMSerialRecord           =       RECORD
            version             :       INTEGER;

            inputDriverName     :       StringHandle;
            outputDriverName    :       StringHandle;
            name                :       StringHandle;

            deviceIcon          :       Handle;

            ratedSpeed          :       LONGINT;
            maxSpeed            :       LONGINT;

            reserved            :       LONGINT;
      END;
```

version

`version` is the version number of the `CRMSerialRecord` data structure. For the version of `CRMSerialRecord` described in this document, `version = curCRMSerRecVer`, which equals 0.

inputDriverName

`inputDriverName` is a pointer to a Pascal-style string, which is the name of the input driver for the given serial port. This driver should behave like the standard input serial port drivers (`.AIn` and `.BIn`), and support the same `csCode` calls as do the standard drivers.

outputDriverName

`outputDriverName` is a pointer to a Pascal-style string, which is the name of the output driver for the given serial port. This driver should behave like the standard output serial port drivers (`.AOut` and `.BOut`), and support the same `csCode` calls as do the standard drivers.

name

`name` is a string handle, which is the name associated with a given port.

deviceIcon

`deviceIcon` is a handle to a relocatable block that contains an icon and a mask associated with the given port. Pass `NIL` if no icon is available.

ratedSpeed

`ratedSpeed` is the maximum *recommended* speed in bits per second.

maxSpeed

`maxSpeed` is the maximum speed in bits per second of which the hardware is capable.

Searching for serial port devices

The following routine will search the Communications Resource Manager linked list for devices of a specified type.

```
PROCEDURE  FindSerialPorts;
VAR
       theCRM        :      CRMRecPtr;
       theCRMRec     :      CRMRec;
       theErr        :      RMErr;
       theSerial     :      CRMSerialPtr;

       old           :      INTEGER;

BEGIN
       theErr  := 0;                       { error status }
       old := 0;                           { index number of ports }
       WHILE (theErr = noErr) DO
       BEGIN
              WITH theCRMRec DO
              BEGIN
                     crmDeviceType  :=  crmSerialDevice;
                     { search for port with index number greater than "old" }
                     crmDeviceID  := old;        { to be filled in later }
              END;
              theCRM        :=  @theCRMRec;
              theCRM        :=  CRMRecPtr(CRMSearch(QElemPtr(theCRM)));

              IF theCRM <> NIL THEN        { got one! }
              BEGIN
                     theSerial  :=  CRMSerialPtr(theCRM^.crmAttributes);
                     old  :=  theCRM^.crmDeviceID;

                     WITH theSerial^ DO
                     BEGIN
                     END;
              END
              ELSE
              BEGIN
                     theErr  := 1;
              END;
       END; { while }
END;
```

Quick reference

This section provides a reference to Communications Resource Manager routines and data structures. At the end of this section is a listing of routine selectors for programming in assembly language.

Routines

Communications Resource Manager routines	*See page*
`CRMGet1IndResource(theType: ResType; index: INTEGER): Handle;`	*177*
`CRMGet1NamedResource(theType: ResType; name: Str255): Handle;`	*178*
`CRMGet1Resource(theType: ResType; theID: INTEGER): Handle;`	*177*
`CRMGetCRMVersion: INTEGER;`	*176*
`CRMGetHeader: QHdrPtr;`	*176*
`CRMGetIndex(theHandle: Handle): LONGINT;`	*178*
`CRMGetIndResource(theType: ResType; index: INTEGER): Handle;`	*177*
`CRMGetIndToolName(bundleType : OSType; index : INTEGER; VAR toolName : Str255) : OSErr;`	*179*
`CRMGetNamedResource(theType: ResType; name: Str255): Handle;`	*178*
`CRMGetResource(theType: ResType; theID: INTEGER): Handle;`	*177*
`CRMInstall(crmReqPtr: QElemPtr);`	*174*
`CRMReleaseResource(theHandle: Handle);`	*178*
`CRMRemove(crmReqPtr: QElemPtr): OSErr;`	*175*
`CRMSearch(crmReqPtr: QElemPtr): QElemPtr;`	*175*
`CRMLocalToRealID(bundleType: ResType; toolID: INTEGER; theKind: ResType; localID: INTEGER): INTEGER;`	*181*
`CRMRealToLocalID(bundleType: ResType; toolID: INTEGER; theKind: ResType; realID: INTEGER): INTEGER;`	*180*
`InitCRM:CRMErr;`	*174*

Constants and data types

```
TYPE
      CRMErr        =      OSErr;

CONST
      crmGenericError     =      -1;
      crmNoErr            =       0;

CONST

      curCRMVersion       =      1;

{ Communications Resource Manager linked list type }
      crmType             =      9;

{ Version of CRMRec data structure }
      crmRecVersion       =      1;

{ local/real resource ID mapping }
      ClassCM       =      'cbnd';
      ClassTM       =      'tbnd';
      ClassFT       =      'fbnd';

TYPE
      CRMRecPtr             =    ^CRMRec;
      CRMRec                =    RECORD
            qLink           :    QElemPtr;
            qType           :    INTEGER;
            crmVersion      :    INTEGER;

            crmPrivate      :    LONGINT;
            crmReserved     :    INTEGER;

            crmDeviceType   :    LONGINT;
            crmDeviceID     :    LONGINT;
            crmAttributes   :    LONGINT;
            crmStatus       :    LONGINT;

            crmRefCon       :    LONGINT;
      END;
```

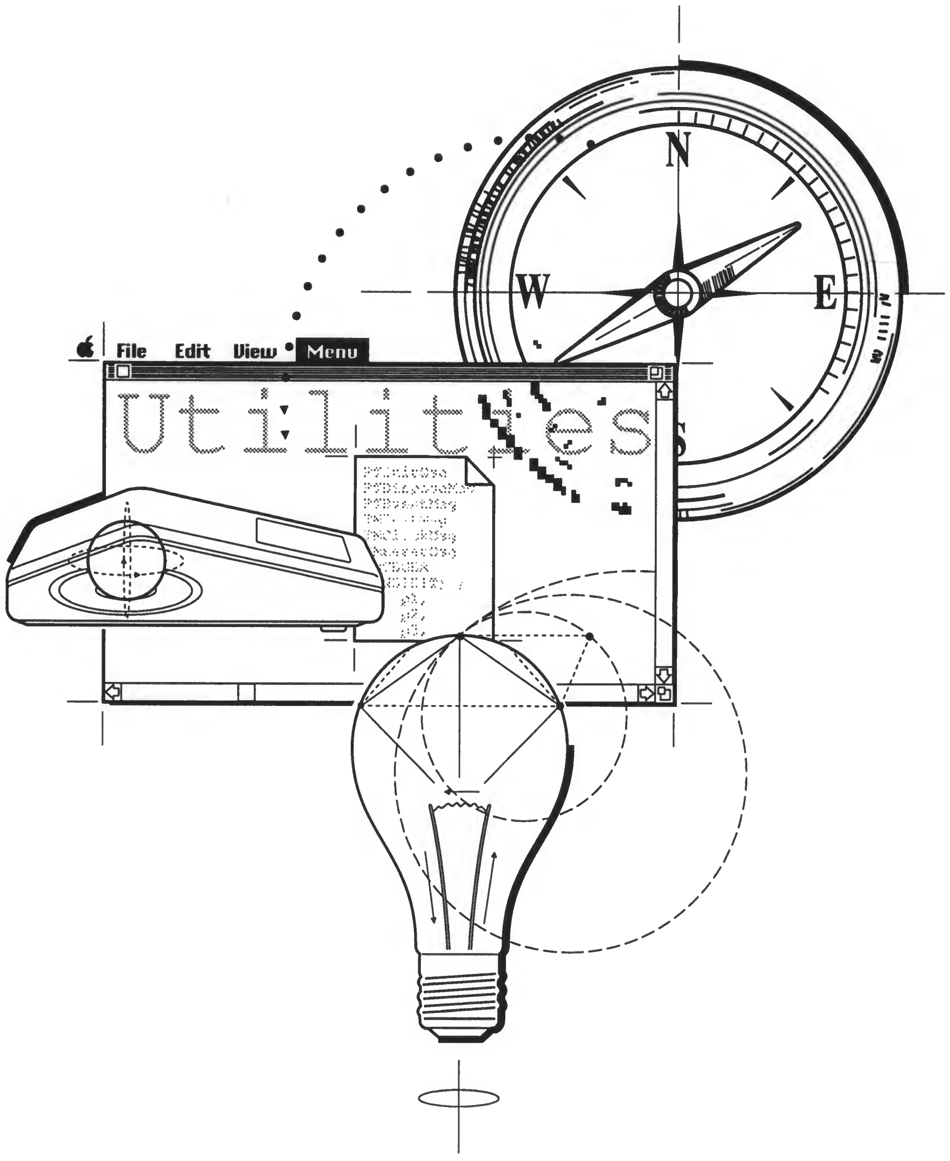
```
TYPE
      CRMSerialPtr                =     ^CRMSerialRecord;
      CRMSerialRecord             =     RECORD
            version               :     INTEGER;

            inputDriverName       :     StringHandle;
            outputDriverName      :     StringHandle;
            name                  :     StringHandle;
            deviceIcon            :     Handle;

            ratedSpeed            :     LONGINT;
            maxSpeed              :     LONGINT;

            reserved              :     LONGINT;
      END;
```

Communications Resource Manager routine selectors

◆ *Assembly note:* The Communications Toolbox routines are accessed via a Macintosh Operating System trap. `A0` contains a pointer to the routine parameters. You can call each of the Communications Tooolbox routines with a macro that has the same name as the routine preceded by an underscore. When expanded, these macros put the routine selector onto the stack, set `A0` to point to the selector, invoke the trap macro `_ComToolTrap ($A08B)`, and finally pop the routine selector back off the stack. It is your application's responsibility to remove the parameters.

```
CRMGet1IndResource    .EQU   1290        CRMGetResource       .EQU   1287

CRMGet1NamedResource  .EQU   1292        CRMInstall           .EQU   1283

CRMGet1Resource       .EQU   1288        CRMLocalToRealID     .EQU   1295

CRMGetCRMVersion      .EQU   1286        CRMRealToLocalID     .EQU   1296

CRMGetHeader          .EQU   1282        CRMReleaseResource   .EQU   1293

CRMGetIndex           .EQU   1294        CRMRemove            .EQU   1284

CRMGetIndResource     .EQU   1289        CRMSearch            .EQU   1285

CRMGetIndToolName     .EQU   1297        InitCRM              .EQU   1281

CRMGetNamedResource   .EQU   1291
```

Chapter 7 **Macintosh Communications Toolbox Utilities**



THIS CHAPTER describes the Communications Toolbox utilities, a set of routines that makes it easier for your application to manipulate dialog item lists, control pop-up menus, and search a network for AppleTalk entities. This chapter also details two routines your application can use to initialize the utilities and obtain the version number of the utilities.

At the end of the chapter you'll find a "Quick Reference" to these routines, data structures, and routine selectors for programming in assembly language.

To use the dialog item list manipulation routines, you need to be familiar with

- the Dialog Manager (described in *Inside Macintosh,* Volumes IV, V)
- the Control Manager (described in *Inside Macintosh,* Volumes I, IV, V)
- the Resource Manager (described in *Inside Macintosh,* Volumes I, IV, V)

To use the network look-up utilities, you need to be familiar with

- AppleTalk (described in *Inside Macintosh,* Volumes II, V)

Communications Toolbox utilities

This section explains the routines and data structures that make up the **Communications Toolbox utilities.** Your application can not call these routines from interrupt level.

Below is a listing of the routines described in this section in the order in which they are presented.

Initializing the Communications Toolbox utilities

`InitCTBUtilities` initializes the Communications Toolbox utilities.

▲ **Warning** Your application must call this routine after calling the standard Macintosh Toolbox initialization routines and the Communications Resource Manager initialization routine (`InitCRM`); your application can then call other Communications Toolbox manager initialization routines. All code that uses any Communications Toolbox routines *must* call this routine once and only once. ▲

Function

```
InitCTBUtilities : CTBUErr;
```

Description

`InitCTBUtilities` returns an operating system error code if appropriate. Valid values are:

```
TYPE
    CTBUErr             =      OSErr;

CONST
    ctbuGenericError    =      -1;
    ctbuNoErr           =       0;
```

Your application must check for the presence of the Communications Toolbox before calling this function. Sample code under "Determining Whether the Managers are Installed" in Appendix B shows you how your application can make this check.

CTBGetCTBVersion

Getting the Communications Toolbox version number

`CTBGetCTBVersion` returns the version number of the Communications Toolbox utilities.

Function

```
CTBGetCTBVersion: INTEGER;
```

Description

The Communications Toolbox version described in this document is:

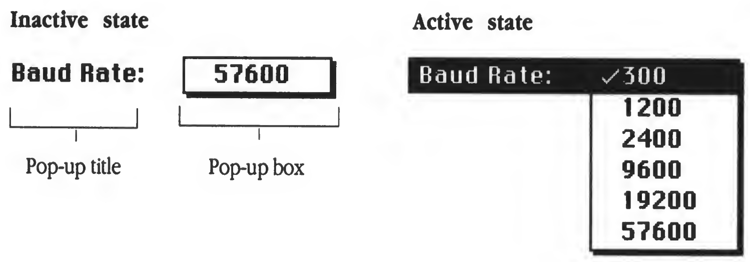
```
CONST
    curCTBUVersion      =      1;
```

Pop-up menu control definition procedure

The Communications Toolbox includes a **control definition procedure** (`'CDEF'`) that extends the function of `PopUpMenuSelect`, which is a part of the Menu Manager in the Macintosh Toolbox. This `'CDEF'`, with resource ID=63, is available on Macintosh computers running with the Communications Toolbox installed.

Your application creates a pop-up menu the same way that it would create any other Macintosh control. *Figure 7-1* shows a pop-up menu control in its inactive and active states.

■ **Figure 7-1** Pop-up menu in its inactive and active states



Function

```
NewControl (theWindow: WindowPtr; boundsRect: Rect;
title:STR255; visible: BOOLEAN; value: INTEGER; min,max:
INTEGER; procID: INTEGER; refCon: LONGINT): ControlHandle;
```

Description

`value` specifies the manner in which the title of the pop-up menu is to be justified and drawn. `value` is a bit field with the following masks:

```
CONST
     popupTitleBold            =     $0100;
     popupTitleItalic          =     $0200;
     popupTitleUnderline       =     $0400;
     popupTitleOutline         =     $0800;
     popupTitleShadow          =     $1000;
     popupTitleCondense        =     $2000;
     popupTitleExtend          =     $4000;
     popupTitleNoStyle         =     $8000;
     popupTitleLeftJust        =     $0000;
     popupTitleCenterJust      =     $0001;
     popupTitleRightJust       =     $00FF;
```

To have the pop-up menu draw the title of the control with more than one of the characteristics listed above, pass in `value` the sum of all desired characteristics.

Once a pop-up menu has been created, the pop-up menu `'CDEF'` sets `value` to its minimum valid value. Your application can then use the value of the control to determine the currently selected item.

`min` represents the resource ID of the menu in the pop-up control when the control is being created. After the control has been created, the pop-up menu `'CDEF'` sets the minimum value of the control to 1.

`max` contains the width of the pop-up title area when the control is being created. After the control has been created, the pop-up menu `'CDEF'` sets the maximum value of the control to the number of items in the pop-up menu.

`procID` should be an integer equal to `popupMenuCDEFproc` plus the appropriate variation code. `popupMenuCDEFproc` is a constant set by Apple Computer and is equal to 1008 (63 times 16). Variation codes are discussed later in "About Variation Codes."

If the pop-up menu is created using the `popupUseAddResMenu` variation code, the pop-up menu `'CDEF'` creates the control and then calls `AddResMenu` to add items to the menu associated with the pop-up menu control. The value in `refCon` is typecast to the type `ResType`, which is used by the routine `AddResMenu`.

For example, if `refCon` is `LONGINT('FONT')`, the pop-up menu control appends a list of the fonts installed in the system to the menu associated with the pop-up menu control.

After the control has been created, your application can use the control's `refCon` field for whatever purpose it requires.

About variation codes

Your application can specify variation codes when it passes a value in `procID`. Variation codes alter the characteristics of the pop-up menu control. To specify the appropriate variation code, your application sums the values that correspond to the desired pop-up menu characteristics with the basic pop-up menu constant `popupMenuCDEFproc`. Valid values are shown next.

Variation code constant	*Description*
`popupFixedWidth`	This constant specifies constant control width. If your application specifies this value, the pop-up menu `'CDEF'` will not resize the control horizontally to fit long menu items. The width of the pop-up box where the currently selected item is drawn equals the width of the control, minus the width of the pop-up title your application specifies when it creates the control. If the contents of the pop-up box do not fit into the space provided, the contents is truncated to fit and ellipses (...) are appended to its end. If this variation code is not specified, the contents of the pop-up box are guaranteed to fit, because the pop-up menu `'CDEF'` resizes the control horizontally.
`popupUseCQD`	This constant specifies the use of Color QuickDraw. If your application specifies this value, the pop-up menu `'CDEF'` uses the colors stored in the menu color table (`'mctb'`) for the color of the pop-up box when Color QuickDraw is available. If Color QuickDraw is unavailable, this variation code is ignored. If the grafPort that owns the control is an old-style (classic QuickDraw) grafPort, the pop-up menu control attempts to create a cGrafPort to draw the pop-up menu control in the correct colors and then dispose of it when finished drawing. By using a cGrafPort, the control avoids the distortion that occurs when converting Color QuickDraw colors to classic QuickDraw colors.
`popupUseAddResMenu`	If your application specifies this value, the pop-up menu `'CDEF'` treats the `refCon` field as a `ResType`, and performs an `AddResMenu` with this resource type on the menu. If the control is being created with the `NewControl` routine, the pop-up menu `'CDEF'` receives `refCon` from your application. If the control is being created with `GetNewControl`, the pop-up menu `'CDEF'` receives `refCon` from the control template (resource type `'CNTL'`).
`popupUseWFont`	If your application specifies this value, the pop-up menu `'CDEF'` draws the pop-up menu control using the font and size of the grafPort that owns the control. The pop-up menu, when active, also uses the font and size specified by the grafPort, instead of using the standard system font.

The values that correspond to the variation code constants are as follows:

```
CONST
     popupFixedWidth     =      $0001;
     popupUseCQD         =      $0002;
     popupUseAddResMenu  =      $0004;
     popupUseWFont       =      $0008;
```

After the pop-up control has been created

After `NewControl` creates the pop-up menu, `min` contains 1, `max` contains the number of items in the menu that is associated with the control, and `refCon` becomes available for the application to use.

In the process of creating the new control, `NewControl` may modify `boundsRect` to reflect the actual width of the pop-up menu box.

Your application can get the currently selected menu item by calling `GetCtlValue`.

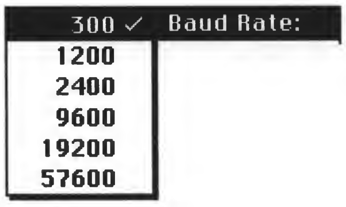
Other pop-up menu control characteristics

There are three pop-up menu control characteristics that you need to be familiar with: how the utility changes the width of the control, how the control changes with regard to system justification, and how your application can access the menu handle.

Whenever the pop-up control is redrawn, the utility calls `CalcMenuSize`. This routine recalculates the size of the menu associated with the control, to allow for the addition of new items in the menu. The pop-up menu `'CDEF'` also updates the width of the pop-up menu control to the sum of the width of the pop-up title, the width of the longest item in the menu (the `menuWidth` field of the menu information record), and some aesthetic white space. As previously described, your application can override this characteristic by using the variation code `popupFixedWidth`.

When the system justification is `teJustRight`, the pop-up control looks like the pop-up menu control shown in *Figure 7-2.*

■ **Figure 7-2** Pop-up menu control when system justification is `teJustRight`



Note that the positions of the pop-up box and the pop-up title are reversed from the standard positions shown in *Figure 7-1.*

Your application obtains the menu handle and the menu ID for the menu associated with the pop-up control by dereferencing the `contrlData` field of the control record. The `contrlData` field is a handle to a block of private information. The first four bytes of this block are the menu handle; the next two bytes are the menu ID for the menu associated with the control. The format of the `popupPrivateData` structure is as follows:

```
TYPE
    popupPrivateData    =     RECORD
          mHandle       :     MenuHandle;
          mID           :     INTEGER;
          mPrivate      :     ARRAY[0..0] OF SignedByte;
    END;
```

Manipulating dialog item lists (DITLs)

As a logical extension to the Dialog Manager routines in the Macintosh Toolbox, the Communications Toolbox provides three procedures to append, shorten, and count the number of items in dialog item lists. You can use these routines regardless of whether or not your program provides communications services.

`AppendDITL`

Appending to a dialog item list

`AppendDITL` lets your application append dialog items to an exisiting dialog box.

Procedure

```
AppendDITL(theDialog: DialogPtr; theDITL: Handle; method:
DITLMethod);
```

Description

`theDialog` is a pointer to the dialog box in which you want to append an item list.

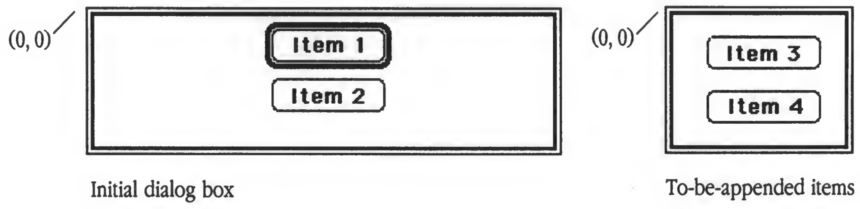
`theDITL` is a handle to the item list that you want to append.

`method` specifies the manner in which you want the items in the new item list to be appended: overlay, right, or bottom. Here are the acceptable vaules for `method`, followed by examples of the results of each method:

```
TYPE
     DITLMethod          =      INTEGER

CONST
     overlayDITL         =      0;
     appendDITLRight     =      1;
     appendDITLBottom    =      2;
```

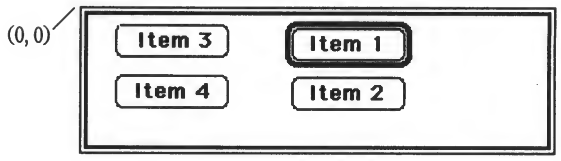
Figure 7-3 shows the initial dialog box, containing items 1 and 2, and the items to be appended, namely items 3 and 4.

■ **Figure 7-3** Initial dialog box and to-be-appended items



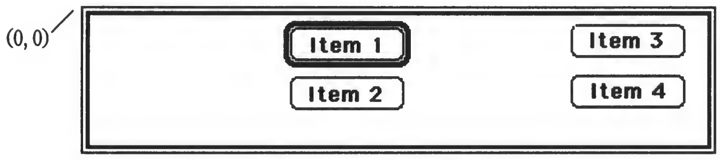
If your application uses `overlayDITL`, `AppendDITL` superimposes the items in the to-be-appended dialog item list onto the dialog item list associated with `theDialog`, as shown in *Figure 7-4*.

■ **Figure** 7-4 Dialog box after appended items are superimposed



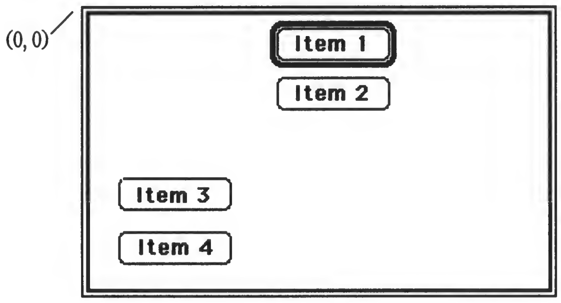
If your application uses `appendDITLRight`, `AppendDITL` offsets the items in the to-be-appended dialog item list by the upper-right coordinate of `theDialog^.portRect`, as shown in *Figure 7-5*. Then `AppendDITL` appends the list to the end of the dialog item list associated with `theDialog`. `AppendDITL` automatically expands the dialog box as needed.

■ **Figure** 7-5 Dialog box after items are appended to the right



If your application uses `appendDITLBottom`, `AppendDITL` offsets the items in the to-be-appended dialog item list by the lower-left coordinate of `theDialog^.portRect`, as shown in *Figure 7-6*. Then, `AppendDITL` appends the list to the end of the dialog item list associated with `theDialog`, and expands the dialog box as needed.

■ **Figure** 7-6 Dialog box after items are appended to the bottom



If you know your application will need to restore a window to the size it was before an `AppendDITL` routine, your application should save that size before it calls `AppendDITL`. `ShortenDITL`, the procedure that shortens dialog item lists, will not automatically resize the dialog box. (`ShortenDITL` is described later in this chapter.)

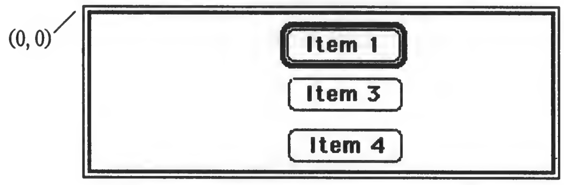
Because `AppendDITL` modifies the contents of `theDITL`, your application must get rid of the dialog item list after calling `AppendDITL`. Here is a typical calling sequence:

```
theDITL := GetResource('DITL', theID);
AppendDITL(theDialog, theDITL, appendDITLBottom);
ReleaseResource(theDITL);
```

Special ways to append items

Your application can append a new dialog item list relative to the location of specific items in the dialog box, rather then appending new dialog items relative to the coordinates of `Dialog^.portRect`. To append a dialog item list in this way, your application uses a negative number in the `method` parameter. This number corresponds to the item that is the point of reference. For instance, if `method` is –2, then the items in the to-be-appended dialog item list have their item boxes offset by the upper-left corner of the item box for item 2 in `theDialog`. *Figure* 7-7 shows how item 3 and item 4 were appended relative to the position of item 2. Item 3, because it was appended relative to the `topLeft` of item 2, appears on top of item 2.

■ **Figure 7-7** Dialog box after items are appended relative to item 2



CountDITL

Counting the number of items in a list

CountDITL returns the number of items in the dialog item list associated with theDialog.

Function `CountDITL(theDialog:DialogPtr): INTEGER;`

ShortenDITL

Shortening a dialog item list

ShortenDITL removes items from the end of the given dialog item list, but does not automatically resize the dialog box. If you know that your application will need to resize the dialog box, save the size before calling AppendDITL and use the Window Manager routine SizeWindow.

Procedure `ShortenDITL(theDialog: DialogPtr; numberItems: INTEGER);`

Description theDialog specifies the dialog box to be shortened.

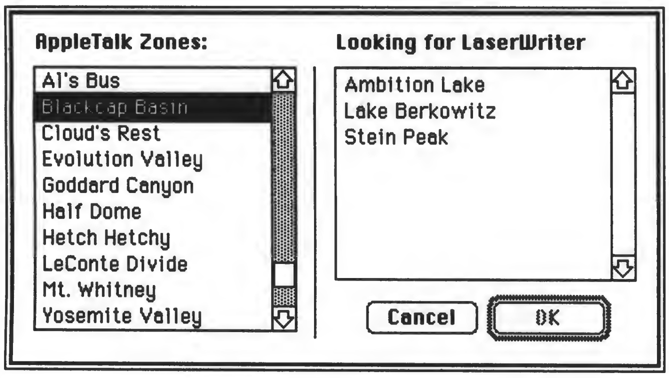
numberItems specifies the number of items to be removed.

Showing AppleTalk entities: `NuLookup` and `NuPLookup`

The network look-up utilities, `NuLookup` and `NuPLookup`, allow your application to present the user with a dialog box containing AppleTalk entities. By providing either `NuLookup` or `NuPLookup` with the proper parameters, your application can include in the dialog box one or more types of AppleTalk entities. Both `NuLookup` and `NuPLookup` perform much the same task, but `NuPLookup` gives you a bit more flexibility.

The results of `NuLookup` and `NuPLookup` are displayed in a dialog box similar to the one in *Figure 7-8*, which shows the results of a search for LaserWriter® printers in the **zone** "Blackcap Basin."

■ **Figure 7-8** Network look-up dialog box



`NuLookup` and `NuPLookup` also provide your application with the option of using filter routines or hook procedures to customize the dialog box or to filter out information that would otherwise be included in it. These routines are described later in this chapter, in "Hook and Filter Procedures."

In the network look-up dialog box, pressing the Return key has the same effect as pressing the OK button. Holding down the Command key and pressing the Period key has the same effect as clicking Cancel. The Up Arrow key and the Down Arrow key change the selected name to either the cell above or the cell below. Holding down the Command key while pressing the Up Arrow key or the Down Arrow key moves the selected zone up or down one cell.

Network lookup

`NuLookup` returns to your application the object/type/zone tuple and AppleTalk node/network/zone numbers tuple for the item that the user selected.

When your application first calls `NuLookup`, this routine builds a zone list (if possible). Then `NuLookup` makes a synchronous **Name Binding Protocol (NBP)** lookup for the specified objects. Next, `NuLookup` builds the preliminary object list and presents the dialog box to the user. At all times while the dialog box is displayed, `NuLookup` continues an asynchronous NBP lookup with long retry and timeout. It ages objects in the name list so that if an object misses several consecutive asynchronous NBP lookups, it is removed from the list. Items that appear in subsequent NBP lookups are added to the list if they were not already in the lookup list.

Both the zone and name lists are alphabetized by using the international utilities.

Function

```
NuLookup(where: Point; prompt: STR255; numTypes: INTEGER;
typeList: NLType; nameFilter: ProcPtr; zoneFilter: ProcPtr;
hookProc: ProcPtr; VAR theReply: LookupReply): INTEGER;
```

Description

`where` indicates in global coordinates where `NuLookup` should place the upper-left corner of the look-up dialog box.

`prompt` is a string displayed at the top of the look-up dialog box. In *Figure 7-8*, the string "Looking for LaserWriter" was passed to `NuLookup`.

`numTypes` is the number of object types that will be included in the lookup. If `numTypes` is –1, `NuLookup` searches for all object types.

`typeList` is a structure of type `NLType`, which is an array of AppleTalk object types, along with a handle to an icon. If no icon is required, pass `NIL` for `hIcon`.

```
TYPE
    NLTypeEntry     =   RECORD
          hIcon     :   Handle;
          typeStr   :   Str32;
    END;

    NLType          =   Array[0..3]of NLTypeEntry;
```

◆ *Assembly note:* Using assembly language, you can specify more than four object types by passing a pointer to an array with the required number of items.

`nameFilter` is a pointer to a procedure that filters out object/type/zone tuples from the network look-up dialog box. `zoneFilter` is a pointer to a procedure that filters out zones from the network look-up dialog box. `hookProc` is a pointer to a hook procedure that modifies the behavior of items in the dialog box or calls a **background procedure.** These three procedures are described later in this chapter, in "Hook and Filter Procedures." If you do not need these routines in your application, specify `NIL`.

`theReply` is the look-up reply record that contains the object/type/zone tuple for the object, if any, that was selected by the user. The record also contains the AppleTalk address consisting of node/network/zone numbers.

```
TYPE
    LookupReply          =      RECORD
          theEntity      :      EntityName;
          theAddr        :      AddrBlock;
    END;
```

When your application initially passes the `theReply` data structure into the `NuLookup` procedure, `theReply.theEntity` should contain the default zone and name. If the specified object is not in the list of accepted objects in `typeList`, the specified object is ignored, and only the default zone is set. If an appropriate match is found in the initial lookup, the specified zone and the specified name of the given object are selected when the dialog box comes up.

`NuLookup` returns one of three values:

```
CONST
    nlOk         =     0;
    nlCancel     =     1;
    nlEject      =     2;
```

`nlOk` is returned if the user clicks the OK button in the dialog box. `nlCancel` is returned if the user clicks the Cancel button. `nlEject` is returned if the dialog box stops because of the hook procedure.

NuPLookup

A more versatile network lookup

`NuPLookup` performs much the same task as `NuLookup`, except that it gives programmers even greater control over customization of the network look-up dialog box. Additional parameters that can be specified are `userData`, `dialogID`, and `filterProc`.

Function

```
NuPLookup(where: Point; prompt: STR255; numTypes: INTEGER;
typeList: NLType; nameFilter: ProcPtr; zoneFilter: ProcPtr;
hookProc: ProcPtr; userData: LONGINT; dialogID: INTEGER;
filterProc: ProcPtr; VAR theReply: LookupReply): INTEGER;
```

`userData` is a field that the user can specify. It may be referenced from the hook procedure or the filter procedure with the `refCon` field of the dialog box record. `refCon` is a handle to the `userData` value.

The following code fragment demonstrates how to access the `userData` field:

```
TYPE
     LongH         =      ^LongPtr;
     LongPtr       =      ^LONGINT;

BEGIN
     myUserData    :=     LongH (GetWRefCon (theDialog))^^;
END;
```

`dialogID` is the resource ID for a dialog box (and for the corresponding dialog item list) that is to replace the standard look-up dialog box. All of the items in the replacement dialog item list must correspond to items in the standard dialog item list, although they can be moved around. *Table 7-1* lists standard items and their placement.

■ **Table 7-1** `TMAddSearch` search-area delimiters

Item number	Type	Rectangle (top, left, bottom, right)
1	OK button	{172, 240, 192, 310}
2	Cancel button	{172, 320, 192, 390}
3	Default highlight (`userItem`)	{168, 236, 196, 314}
4	Title (`staticText`)	{5, 15, 21, 210}
5	Item list (`userItem`)	{25, 15, 189, 210}
6	Zone list title (`staticText`)	{5, 240, 21, 391}
7	Zone list (`userItem`)	{25, 240, 147, 391}
8	Line (`userItem`)	{25, 225, 193, 226}
9	Version (`userItem`)	{197, 360, 207, 400}
10–13	Reserved	

`filterProc` is a modal dialog box filter procedure that `NuPLookup` calls after the standard `NuLookup` modal dialog box filter procedure. The format of the filter procedure is the same as that of a standard modal dialog box filter procedure. See Chapter 13 of *Inside Macintosh,* Volume I for more information about modal dialog filter procedures.

Hook and filter procedures

You can customize the operation of the network look-up dialog box for specific applications by using the filter procedures and the hook procedure. Filter procedures are used to filter out zones from inclusion in the zone list, or to filter out objects from the object list. The hook procedure is used to modify the behavior of items in the dialog box, and can also be used to call a background procedure.

`MyNameFilter`

Name filters

Before each item name is included in the network look-up dialog list, the item is passed to the name filter procedure for processing. Specify `NIL` if there is no filter procedure.

Function `MyNameFilter(theEntity: EntityName): INTEGER;`

Description This filter procedure is passed the network entity in `theEntity`, and returns an integer with one of the following values:

```
CONST
    nameInclude  =     1;
    nameDisable  =     2;
    nameReject   =     3;
```

`nameInclude` results in the inclusion of `theEntity` in the name list of the network look-up dialog box. `nameDisable` results in the inclusion of `theEntity` but disables it; the item in the list is visible but dimmed, and cannot be selected. `nameReject` causes `theEntity` not to appear in the list.

Zone filters

Before each zone item is included in the network look-up dialog list, the item is passed to the zone filter procedure for processing. Specify `NIL` if there is no filter procedure.

Function

```
MyZoneFilter(theZone: STR32): INTEGER;
```

Description

`NuLookup` and `NuPLookup` pass the name of an AppleTalk zone in `theZone` to the zone filter procedure, which returns an integer with one of the following values:

```
CONST
     zoneInclude  =      1;
     zoneDisable  =      2;
     zoneReject   =      3;
```

`zoneInclude` results in the inclusion of `theZone` in the zone list in the network look-up dialog box. `zoneDisable` results in the inclusion of `theZone` but disables it; the item in the zone list is visible, but dimmed, and cannot be selected. `zoneReject` causes `theZone` not to appear in the zone list.

The hook procedure

`NuLookup` and `NuPLookup` call `MyHookProc` immediately after `ModalDialog` and before the standard hook procedure. `ModalDialog` returns a number that corresponds to the item clicked in the dialog box. `NuLookup` and `NuPLookup` employ a modal dialog box filter procedure that returns the item number for any physical items clicked in the dialog box, as well as the item numbers of any fake item clicked.

Function

```
MyHookProc(item: INTEGER; theDialog: DialogPtr): INTEGER;
```

Appropriate fake and real dialog box items are as follows:

```
CONST
{  real items in the dialog item list  }
    hookOK              =     1;
    hookCancel          =     2;
    hookOutline         =     3;
    hookTitle           =     4;
    hookItemList        =     5;
    hookZoneTitle       =     6;
    hookZoneList        =     7;
    hookLine            =     8;
    hookVersion         =     9;
    hookReserved1       =     10;
    hookReserved2       =     11;
    hookReserved3       =     12;
    hookReserved4       =     13;

{  fake items in dialog item list     }
    hookNull            =     100;
    hookItemRefresh     =     101;
    hookZoneRefresh     =     102;
    hookEject           =     103;
    hookPreflight       =     104;
    hookPostflight      =     105;
    hookKeyBase         =     1000;
```

The first 13 items correspond to physical items in the dialog item list. The other items are fake items that correspond to certain actions that may need to be performed.

`hookNull` is a fake event that corresponds to a null event. The standard modal dialog box filter procedure returns `hookNull` in `itemHit` for null events.

`hookItemRefresh` causes the item list in the look-up dialog box to be discarded and regenerated.

`hookZoneRefresh` causes the zone list in the look-up dialog box to be discarded and regenerated. This value also causes a `hookItemRefresh` event to be generated.

`hookEject` causes all outstanding NBP lookups to be terminated and `nLEject` to be returned by `NuLookup`.

`hookPreflight` is processed after the zone and object lists are formed, but before the dialog box is displayed.

`hookPostflight` is processed before the dialog box is disposed of.

Any item greater than `hookKeyBase` is actually the ASCII value of the key that is pressed, offset by `hookKeyBase`. For example, an `itemHit` of 1032 decimal would correspond to a `keyDown` event generating a space (ASCII 32 decimal).

cmSsetupMsg

Your setup-definition code resource should perform a function similar to that shown in the example code when it receives `cmSsetupMsg` from the Connection Manager.

When passed to your connection tool, `p3` will be a pointer to `magicCookie`, which is a `LONGINT`.

```
PROCEDURE Setup(pSetup: CMSetupPtr);
CONST
       myFirstItem = 1;
       mySecondItem = 2;

VAR
       first:   INTEGER;            { first item appended (0-based) }
       pConfig:ConfigPtr;

BEGIN
       WITH pSetup^ DO
       BEGIN
              first := count - 1;               { count is 1-based }
              pConfig := ConfigPtr(theConfig);        { get the config ptr }

              GetDItem(theDialog, first+myFirstItem, itemKind, itemHandle,
                        itemRect);
              SetCtlValue(ControlHandle(itemHandle), pConfig^.foobar);


              GetDItem(theDialog, first+mySecondItem, itemKind, itemHandle,
                    itemRect);
              SetCtlValue(ControlHandle(itemHandle), 1-pConfig^.foobar);

       END; {with}
END;
```

cmSitemMsg

Your setup definition code resource should perform a function similar to that shown in the example code when it receives `cmSitemMsg` from the Connection Manager.

When passed to your connection tool, `p1` points to an item that was selected from the dialog item list, and `p3` contains a pointer to `magicCookie`. Your tool can change the selected item by modifying the item number to which `p1` points.

```
PROCEDURE Item(pSetup: CMSetupPtr; pItem: IntPtr);
CONST
      myFirstItem         =      1;
      mySecondItem        =      2;

VAR
      first               :      INTEGER;          { first item appended (0-based) }
      pConfig             :      ConfigPtr;
      value               :      INTEGER;
BEGIN
      WITH pSetup^ DO
      BEGIN
            first := count - 1;                    { count is 1-based }
            pConfig := ConfigPtr(theConfig);       { get the config ptr }

            CASE pItem^-first OF
            myFirstItem:
                  BEGIN
                  GetDItem(theDialog,first+myFirstItem,itemKind,
                           itemHandle,itemRect);
                  value := GetCtlValue(ControlHandle(itemHandle))
                  value := 1 - value;
                  pConfig^.foobar := value; { stick into config record }
                  SetCtlValue(ControlHandle(itemHandle), value); { update control }
                  END;
            mySecondItem:
                  BEGIN
                  SysBeep(5);
                  FlashMenuBar(0);
                  END;
            END; { case }
      END; { with }
END;
```

`cmSfilterMsg`

Your setup definition code resource should perform a function similar to that shown in the example code when it receives `cmSfilterMsg` from the Connection Manager.

When passed to your connection tool, `p1` will contain a pointer to an event record, `p2` will contain a pointer to an item clicked in the dialog list, and `p3` will contain a pointer to `magicCookie`.

If the event that was passed to this function was handled, your connection tool should return 1; otherwise, it should return 0.

cmMsetMsg

Your tool will receive `cmMsetMsg` from the Connection Manager when the application requires your tool to set the fields of the connection record to values that are specified in a string. The Connection Manager will pass a pointer to this string as a parameter to this call. The sample code shows how your tool can handle `cmMsetMsg`.

When passed to your connection tool's scripting interface code resource, `p1` will be a pointer to an American English null-terminated string that contains tokens representing a configuration record.

Your tool should return one of the following values: a number less than –1 to indicate an `OSErr`, –1 to indicate a generic error, 0 if there was no problem with the string, or a positive number to indicate the character position where parsing was stopped.

The Connection Manager automatically calls `CMValidate` after your tool has responded to `cmMsetMsg`.

```
FUNCTION SetConfig(hConn: ConnHandle; theSource: Ptr): INTEGER;
VAR
        pConfig       : ConfigPtr;        { tool specific config record }
        paramStr,
        valueStr      : Str255;           { param and value strings }
        outOfTokens   : BOOLEAN;          { end of the line? }
        returnVal     : INTEGER;          { what to return }
BEGIN
        { Init some stuff   }
        pConfig  := ConfigPtr(hConn^^.config);
        returnVal  := noErr;

        IF  (theSource^  =  CHR(0))  THEN
                outOfTokens  := TRUE
        ELSE
                outOfTokens  := FALSE;

        WHILE  NOT  outOfTokens  DO  BEGIN
                (* Build the first token and put it into paramStr *)


                IF  (paramStr  =  'FOOBAR')  THEN  BEGIN
                        (* Build the next token and put it into valueStr *)

                        pConfig^.foobar  :=  valueStr;

                END
                ELSE  BEGIN
                        (* returnVal  =  location of the paramStr *)
                        LEAVE;
                END;


                (* index to next token *)

        END;  { while }

        SetConfig  :=  returnVal;
END;
```

The localization code resource

Your connection tool's localization code resource is responsible for providing the services necessary to localize your tool. It must handle two messages, `cmL2English` and `cmL2Intl`.

Your localization code resource should be a resource of type `'cloc'`. It should be able to handle the parameters shown in the example code.

```
FUNCTION     cloc(hConn: ConnHandle; msg: INTEGER; p1, p2, p3: LONGINT) : LONGINT;
```

Valid values for `msg` are as follows:

```
CONST
       cmL2English   =      0;
       cmL2Intl      =      1;
```

For each of the messages defined here, `p1`, `p2`, and `p3` take on different meanings. These meanings are discussed in the message descriptions that follow.

`cmL2English` and `cmL2Intl`

Your tool will receive `cmL2English` from the Connection Manager when the application requires your tool to localize a string to English. When the parameters `p1`, `p2`, and `p3` are passed to your tool, `p1` will contain a pointer to a localized null-terminated string that contains tokens representing a configuration record; `p2` will contain a pointer that points to a second pointer. Your tool will have to allocate space for this pointer (by calling `NewPtr`), which contains the American English null-terminated configuration string. `p3` will contain a language identifier, which is defined in the discussion of the Script Manager in *Inside Macintosh,* Volume V.

Your tool will receive `cmL2Intl` from the Connection Manager when the application requires your tool to localize a string to a language other than English. When the parameters `p1`, `p2`, and `p3` are passed to your tool, `p1` will contain a pointer to an American English null-terminated string that contains tokens representing a configuration record; `p2` will contain a pointer to a second pointer. Your tool will have to allocate space for this pointer, which contains the localized configuration string. `p3` will contain a language identifier, which is defined in the Script Manager in *Inside Macintosh,* Volume V. The next code example shows how your tool can handle both `cmL2English` and `cmL2Intl`.

After executing the code necessary to respond to `cmL2English` or `cmL2Intl`, your routine should return `NIL` if there was a Memory Manager error or if the language requested is not available. It should also return any appropriate error code in the status field of the connection record.

```
{ main entry point for cloc resource }
FUNCTION cloc(hConn: ConnHandle; msg: INTEGER; p1, p2, p3: LONGINT): LONGINT;
TYPE
       PtrPtr = ^Ptr;

VAR
       outPtr: Ptr;
       procID: INTEGER;
```

```
begin
      outPtr  := PtrPtr(p2)^;           { get output pointer }
      case msg of
            cmL2English:
                  cloc := Translate( Ptr(p1),outPtr,p3,verUS);
            cmL2Intl:
                  cloc := Translate( Ptr(p1),outPtr,verUS,p3);
      end; {case}
      PtrPtr(p2)^ := outPtr;            { return output pointer }
end; { mytscrDEF }

{ Translates an input config string from one language to another }
{ returns 0 if no problem, non zero if there is a problem }
{ This routine needs to allocate outputStr. }
{ if language is not supported, return 0 but leave outputStr NIL }

function Translate( inputStr: Ptr; var outputStr: Ptr;
                    fromLanguage,toLanguage: longint): longint;
BEGIN
end; { Translate }
```

`config`: the configuration record

An application using your tool may save and restore the contents of a configuration to set the state of the connection at any time. The configuration record, therefore, should be self-contained and should not contain any pointers or handles to other data structures. Your tool allocates this record in response to `cmDefaultMsg`. The Connection Manager, not the tool, deallocates the configuration record when the application calls `CMDispose`.

Quick reference

This section contains reference information for the data structures, definition procedures, and resource types that you need to write a terminal tool. A table at the end of this section lists messages the Connection Manager sends to connection tools, and what is passed in the parameters with each message.

Data structures

```
TYPE
        CMSetupPtr          =       ^CMSetupStruct;
        CMSetupStruct       =       RECORD
                theDialog   :       DialogPtr;
                count       :       INTEGER;
                theConfig   :       Ptr;
                procID              :       INTEGER
        END;
```

Definition procedures

```
FUNCTION  cdef(hConn:   ConnHandle;  msg:  INTEGER;  p1, p2, p3:  LONGINT) : LONGINT;

FUNCTION  cval(hConn:   ConnHandle;  msg:  INTEGER;  p1, p2, p3:  LONGINT) : LONGINT;

FUNCTION  cset(pSetup:  CMSetupPtr;  msg:  INTEGER;  p1, p2, p3:  LONGINT) : LONGINT;

FUNCTION  cscr(hConn:   ConnHandle;  msg:  INTEGER;  p1, p2, p3:  LONGINT) : LONGINT;

FUNCTION  cloc(hConn:   ConnHandle;  msg:  INTEGER;  p1, p2, p3:  LONGINT) : LONGINT;
```

Resource types

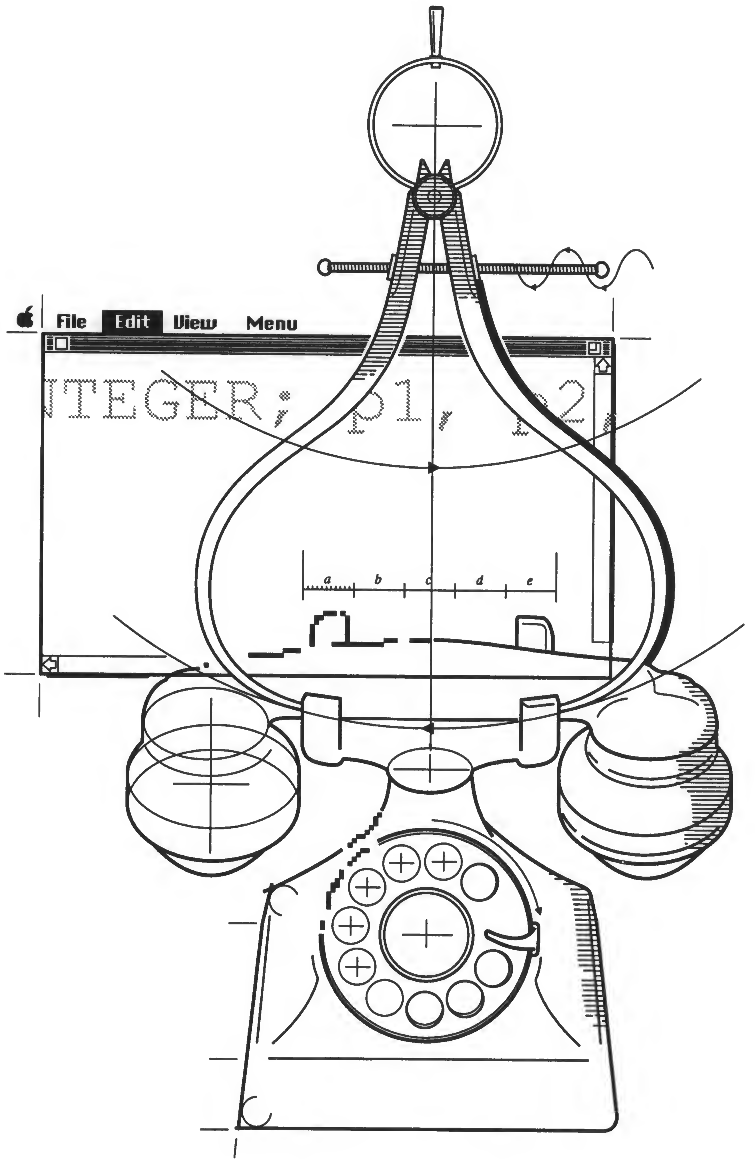
```
type 'cbnd' {
        integer = $$CountOf(TypeArray) - 1;
        array TypeArray {
                literal longint;    /* Type  */
                integer = $$CountOf(IDArray) - 1;
                wide array IDArray {
                        integer;    /* Local ID  */
                        integer;    /* Actual ID  */
                };
        };
};
```

■ **Table 8-1** Connection Manager messages and parameters

	Constant	Parameter 1 p1	Parameter 2 p2	Parameter 3 p3
Validation code resource messages				
cmValidateMsg*	0	-	-	-
cmDefaultMsg	1	VAR cmConfigRec:Ptr	allocate:Boolean	procID:short
SetUp code resource messages				
cmSpreflightMsg*	0	-	-	VAR magicCookie:LONGINT
cmSsetupMsg	1	-	-	VAR magicCookie:LONGINT
cmSitemMsg	2	VAR item:itemSelected	-	VAR magicCookie:LONGINT
cmSfilterMsg*	3	myEvent:EventRecord	VAR item:itemHit	VAR magicCookie:LONGINT
cmScleanupMsg	4	-	-	VAR magicCookie:LONGINT
Scripting code resource messages				
cmMgetMsg*	0	-	-	-
cmMsetMsg*	1	configPtr:Ptr	-	-
Localization code resource messages				
cmL2English*	0	inputPtr:Ptr	VAR outputPtr:Ptr	fromLanguage:integer
cmL2Intl*	1	inputPtr:Ptr	VAR outputPtr:Ptr	toLanguage:integer

* Indicates the routine is a function that returns a LONGINT.

Chapter 9 **Writing Connection Tools**



THIS CHAPTER tells you how to write the main code resource for a connection tool. There are at least five other code resources that you need to include as part of your tool; they are described in Chapter 8. You should read that chapter, as well as Chapter 3, before reading this chapter.

This chapter describes all the messages, parameters, and data structures that the Connection Manager passes to your tool's main code resource. Also in this chapter is sample code (with pseudocode mixed in) that will help you understand what your tool should do when it receives any of the messages. A quick reference at the end of the chapter shows you what you should name your six connection tool resources. It also lists the messages the Connection Manager sends to your tool, and the parameters that the Connection Manager passes with each message.

Your connection tool's main code resource

The purpose of the main code resource is to parse messages from the Connection Manager and then to branch to a routine that can handle each message. The main code resource should be a resource of type `'cdef'` and should be able to accept the parameters shown here.

```
FUNCTION     cdef(hConn: ConnHandle; msg: INTEGER; p1, p2, p3: LONGINT) : LONGINT;
```

The messages accepted by the main code resource, and their associated values, are as follows:

```
CONST
        cmInitMsg           =      0;
        cmDisposeMsg        =      1;
        cmSuspendMsg        =      2;
        cmResumeMsg         =      3;
        cmMenuMsg           =      4;
        cmEventMsg          =      5;
        cmActivateMsg       =      6;
        cmDeactivateMsg     =      7;
        cmIdleMsg           =      50;
        cmResetMsg          =      51;
        cmAbortMsg          =      52;
        cmReadMsg           =      100;
        cmWriteMsg          =      101;
        cmStatusMsg         =      102;
        cmListenMsg         =      103;
        cmAcceptMsg         =      104;
        cmCloseMsg          =      105;
        cmOpenMsg           =      106;
        cmBreakMsg          =      107;
        cmIOKillMsg         =      108;
        cmEnvironsMsg       =      109;
```

For each of the messages defined here, the three parameters `'cdef'` returns, namely `p1`, `p2`, and `p3`, take on different meanings. These parameters are described in the message descriptions that follow. Your tool can return an appropriate operating-system error code, or `cmNotSupported` if it does not undertand the message it received.

cmResetMsg

The Connection Manager will send `cmResetMsg` to your tool when the application requires your tool to reset the connection. The specific state to which your tool should reset the connection depends upon the connection protocol.

cmMenuMsg

The Connection Manager will send `cmMenuMsg` to your tool when a menu event has occurred in the application. When passed to your tool, `p1` will contain the menu ID, and `p2` will contain the menu item.

The sample code shows you a basic template into which you can code your tool's response to `cmMenuMsg`. When done, your tool should pass back 0 if the menu event was not handled, and 1 if it was.

```
FUNCTION myMenu(hConn : ConnHandle; mID : INTEGER; mItem: INTEGER) : LONGINT;
BEGIN
	myMenu := 0;
	{ if mine then
		begin
			myMenu := 1;
			Process the menu command.
		end;
	}

END;
```

cmListenMsg

An application will call the `CMListen` routine when it requires your tool to wait for an incoming connection request. When passed to your tool, `p1` will contain the address of `CMCompletorRecord`, and `p2` will contain the timeout value in ticks.

Your tool uses a `CMCompletorRecord` structure when it receives a message to process asynchronously. This record contains a pointer to a completion routine your tool calls upon completion of the specified operation.

If the operation is to be performed asynchronously, the `async` field of the `CMCompletorRecord` is `TRUE` and the pointer to the completion routine is in the `completionRoutine` field. If the operation is to be performed synchronously, the `async` field of the `CMCompletorRecord` is `FALSE`. Your tool should ignore the `completionRoutine` field in this case.

The `CMCompletorRecord` is created in a local stack frame by the Connection Manager; therefore, your tool should copy the contents of the `CMCompletorRecrd` data structure if any information in it will be needed later.

```
TYPE
	CMCompletorPtr		=	^CMCompletorRecord;
	CMCompletorRecord	=	RECORD
		async			:	BOOLEAN;
		completionRoutine	:	ProcPtr;
	END;
```

The sample code shows you a basic template into which you can code your tool's response to `cmListenMsg`. When done, your tool should pass back an appropriate error code.

```
FUNCTION myListen(hConn : ConnHandle; completor : CMCompletorPtr;
                    timeout : LONGINT) : CMErr;
BEGIN
      { If connection is already open, return error condition }
      { Establish physical layer driver }
      { If completor^.async then
        begin
             Do async listen call.
             Set listen pending flag.
             Issue VBL task to terminate listen in specified timeout.
        end
        else
             Do sync listen call and return error when timeout.
      }
END;
```

cmIdleMsg

Your tool will receive `cmIdleMsg` when the application has idle time, such as when it needs your tool to check the status of an asynchronous routine. An application can not call `CMIdle` from interrupt level.

cmEventMsg

The Connection Manager will pass `cmEventMsg` to your tool when an event occurred in a window associated with the connection tool. The sample code shows a template into which you can code your tool's response to `cmEventMsg`.

When passed to your tool, `p1` will be a pointer to the event record. The reference constant field of the window record will contain the connection handle.

```
PROCEDURE myEvent(hConn : ConnHandle; theEvent : EventRecord);
CONST
      CancelButton =    2;
VAR
      theDialog     :    DialogPtr;
      theItem       :    INTEGER;

BEGIN
      { Check if it is a dialog related event }
      if IsDialogEvent(theEvent) then
      begin
            { get the item hit }
            if DialogSelect(theEvent,theDialog,theItem) then
            begin
                  if theItem = CancelButton then
                        { Cancel the connection }
            end;
      end
      else
            { Handle the keyDown, updateEvt, mouseDown and any other event here }
END;
```

`cmAbortMsg`

The Connection Manager will pass `cmAbortMsg` to your tool when the application has requested that a pending open or listen be aborted. The sample code shows a template into which you can code your tool's response to `cmAbortMsg`.

```
PROCEDURE myAbort(hConn : ConnHandle);
BEGIN
      { If not listen or open pending, return error condition. }
      { Terminate listen or open process. }
      { Close the physical layer driver. }
END;
```

`cmAcceptMsg`

The Connection Manager will pass `cmAcceptMsg` to your tool when the application has called the `cmAccept` routine. When passed to your tool, `p1` will contain 1 if your tool should accept the open request, or 0 if it should reject it.

Once your tool receives this message, it should clear the `cmStatusIncomingCallPresent` bit the next time it receives a `cmStatusMsg`.

The sample code shows a template into which you can code your tool's response to `cmAcceptMsg`. When finished, your tool should return an appropriate error code.

```
FUNCTION myAccept(hConn : ConnHandle; accept : INTEGER) : CMErr;
BEGIN
      { If the connection is already open, return error condition. }
      if accept <> cmAcceptOK then
      begin
            { Terminate the logical connection listen process. }
            { Close the physcial layer driver. }
      end
      else
            { set the open status bit }
END;
```

`cmActivateMsg` and **`cmDeactivateMsg`**

The Connection Manager will pass `cmActivateMsg` or `cmDeactivateMsg` to your tool when the application requires your tool to perform an action, such as installing or removing a menu from the menu bar in response to an activate or deactivate message.

`cmSuspendMsg` and **`cmResumeMsg`**

The Connection Manager will pass `cmSuspendMsg` or `cmResumeMsg` to your tool when the application requires your tool to perform an action, such as installing or removing a menu from the menu bar in response to a suspend or resume message.

cmInitMsg

The Connection Manager will pass `cmInitMsg` to your tool after the following sequence of events occurs. When a tool or application calls `CMNew`, the Connection Manager allocates space for the connection record. It then fills in some of the fields, based upon information that was passed in the parameters to the call. The Connection Manager fills in the `config` and `oldConfig` fields by calling `CMDefault`. Then, the Connection Manager passes `cmInitMsg` to your tool. After your tool has finished responding to `cmInitMsg`, the Connection Manager calls `CMValidate`.

If your tool allocates space for internal buffers in the `bufferArray` field of the connection record, applications and the Connection Manager must not manipulate the space. Also, your tool is responsible for freeing the space (in response to `cmDisposeMsg`). Connection tools are not required to use the `bufferArray` field.

The sample code shows how your tool can respond to `cmInitMsg`. After executing the code necessary to respond to `cmInitMsg`, your code should pass back an appropriate `OsErr` or `CMErr`.

```
FUNCTION     myInit(hConn:  ConnHandle):  CMErr;
VAR
        state:        SignedByte;

BEGIN
        myInit  :=  noErr;                          {  optimism  }
        state  :=  HGetState(Handle(hConn));        {  save  handle  state  }
        HLock(Handle(hConn));                       {  lock  it  down  }

        WITH  hConn^^  DO
        BEGIN
                flags  :=  BOR(flags,  cmData);     {  yes  we  do  data  }
                IF  BAND(flags,  cmAttn)  <>  0  THEN       {  turn  off  attention  }
                        flags  :=  BXOR(flags,  cmAttn);
                IF  BAND(flags,  cmCntl)  <>  0  THEN       {  turn  off  control  }
                        flags  :=  BXOR(flags,  cmCntl);

                errCode  :=  noErr;                 {  optimism  reigns  }

                {  need  to  check  MemErr  here  }
                bufferArray[cmDataIn]   :=  NewPtr(bufSizes[cmDataIn]);
                bufferArray[cmDataOut]  :=  NewPtr(bufSizes[cmDataOut]);

                private  :=  PrivatePtr(NewPtr(SIZEOF(PrivateData)));
                WITH  private^  DO
                BEGIN
                {  fill  in  private  data  structure  here  }
                END;
        END;

        HSetState(Handle(hConn),  state);
END;
```

cmDisposeMsg

A tool or application will call `CMDispose` when it must dispose of a connection record and its associated data structures.

The Connection Manager passes `cmDisposeMsg` to your tool before disposing of the `config` and `oldConfig` fields of the connection record. Next, the Connection Manager disposes of the connection record.

To handle `cmDisposeMsg`, your tool should dispose of any buffers allocated in response to `cmInitMsg` and any private data storage (referenced off of `cmPrivate` in the connection record). Your tool must not attempt to dispose of either `config` or `oldConfig` in the connection record, or of the connection record itself. Doing so will cause a system crash.

The sample code shows how your tool can respond to `cmDisposeMsg`.

```
FUNCTION myDispose(hConn: ConnHandle): CMErr;
VAR
       pPrivate: PrivatePtr;           { tool privates }

BEGIN
       myDispose := noErr;

{ if the connection is open then call CMClose on it }

       DisposPtr( Ptr(hConn^^.private) );
       DisposPtr( Ptr(hConn^^.bufferArray[cmDataIn]) );
       DisposPtr( Ptr(hConn^^.bufferArray[cmDataOut]) );
END;
```

cmReadMsg and cmWriteMsg

A tool or application will call `CMRead` when it requires your tool to read data from a remote entity. Likewise, a tool or application will call `CMWrite` when it requires your tool to write data to a remote entity. The Connection Manager will handle these calls by passing `cmReadMsg` or `cmWriteMsg` to the appropriate connection tool.

If a channel is requested that is not supported by your tool (for example, if a read is requested on the attention channel when the attention channel is not supported), your tool should return `cmNotSupported`.

After executing the code necessary to respond to `cmReadMsg` or `cmWriteMsg`, your tool should pass back an appropriate `OSErr` or `CMErr`.

When `cmReadMsg` or `cmWriteMsg` is passed to your tool, `p1` points to the `CMDataBuffer` record, `p2` points to the `CMCompletorRecord` record, and `p3` contains the timeout value. The timeout value specifies a time period, in ticks, within which the read operation must complete. If your tool does not complete within the specified time, it should pass back a timeout error. An application passes -1 when it wants no timeout. If the application specifies 0, your connection tool should read as many bytes, up to `toRead` bytes, as it can in one read attempt.

Depending on the connection protocol your tool is supporting, your tool might ignore the timeout parameter.

The `CMDataBuffer` *record*

A `DataBuffer` record contains information about where the read or write buffer is located, how many bytes are supposed to be read or written, the channel that is to be used, and an end-of-message flag. Your tool should be able to accommodate the data structure defined here:

```
TYPE
        CMDataBufferPtr      =      ^CMDataBuffer;
        CMDataBuffer         =      RECORD
                thePtr       :      Ptr;
                count        :      LONGINT;
                channel      :      CMChannel;
                flags        :      CMFlags;
        END;
```

These are the valid values for `channel`:

```
CONST
        cmData        =      $00000001;
        cmCntl        =      $00000002;
        cmAttn        =      $00000004;
```

The `CompletorRecord` *record*

Your tool uses a `CMCompletorRecord` structure when it receives a message to process asynchronously. This record contains a pointer to a completion routine your tool calls upon completion of the specified operation.

If the operation is to be performed asynchronously, the `async` field of the `CMCompletorRecord` is `TRUE` and the pointer to the completion routine is in the `completionRoutine` field.

If the operation is to be performed synchronously, the `async` field of the `CMCompletorRecord` is `FALSE`. Your tool should ignore the `completionRoutine` field in this case.

The `CMCompletorRecord` is created in a local stack frame by the Connection Manager; therefore, your tool should copy the contents of the `CMCompletorRecord` data structure if any information in it will be needed later.

```
TYPE
        CMCompletorPtr              =      ^CMCompletorRecord;
        CMCompletorRecord           =      RECORD
                async               :      BOOLEAN;
                completionRoutine   :      ProcPtr;
        END;
```

cmReadMsg

If your tool receives `cmReadMsg` with `timeout` 0, it should return immediately, even if it cannot read all the requested bytes. For example, if your tool receives a read request with `timeout` 0 for 512 bytes, and only 63 are available, your tool should read 63 bytes, put 63 in the `count` field of the `CMDataBuffer`, and return `noErr`.

```
FUNCTION myRead(hConn : ConnHandle; dp : CMDataBufferPtr;
                completor : CMCompletorPtr;timeout : LONGINT) : CMErr;
VAR
    pPrivate     : privateptr;
    err          : OSErr;

BEGIN

    dp^.flags := 0;     { set flags to zero, this tool does not support it }
    pPrivate := privateptr(hConn^^.cmPrivate);
    { is connection open ? }
    if (BAND(pPrivate^.status , cmStatusOpen) = 0) then
    begin
        myRead :=  cmNotOpen;
        EXIT(myRead);
    end;

    if ( dp^.channel <> cmData) then    { trying to do something we cannot support }
    begin
        dp^.count := 0;
        myRead :=  cmNotSupported;
        EXIT(myRead);
    end;

    { if async read then install VBL task to check time out
      else check the available data to read in driver buffer }

    { do the read }
    err := PBRead( ParmBlkPtr(@pPrivate^.myRBlk.theParamBlk),
                completor^.async );

    { handle err condition }
    if err <> noErr then
    begin
        dp^.count := 0;
        hConn^^.errCode := err;
        myRead := err;
        EXIT(myRead);
    end;

    { set the bytes read }
    if (pPrivate^.myRBlk.theParamBlk.ioActCount = 0) &
        ((completor <> nil) & completor^.async) then
    begin
        dp^.count := 0;
        hConn^^.asyncCount[cmDataIn] := 0;
    end
    else
```

```
        begin
              dp^.count  :=  pPrivate^.myRBlk.theParamBlk.ioActCount;
              hConn^^.asyncCount[cmDataIn]  :=
                          pPrivate^.myRBlk.theParamBlk.ioActCount;
        end;

        myRead :=  noErr;
END;
```

cmWriteMsg

If your tool receives a `cmWriteMsg` with `timeout` 0, it should return immediately, even if it cannot write all the requested bytes. For example, if your tool receives a write request with `timeout` 0 for 512 bytes, and only 63 can be written immediately, your tool should write 63 bytes, put 63 in the `count` field of the `CMDataBuffer`, and return `noErr`.

```
FUNCTION myWrite(hConn : ConnHandle; dp : CMDataBufferPtr;
                 completor : CMCompletorPtr;timeout : LONGINT) : CMErr;
VAR
      pPrivate     : privateptr;
      err          : OSErr;

BEGIN
      pPrivate  :=  privateptr(hConn^^.cmPrivate);

      { is connection open ? }
      if (BAND(pPrivate^.status , cmStatusOpen) = 0) then
      begin
            myWrite :=  cmNotOpen;
            EXIT(myWrite);
      end;

      if ( dp^.channel <> cmData) then
      { trying to do something we cannot support }
      begin
            dp^.count := 0;
            myWrite :=  cmNotSupported;
            EXIT(myWrite);
      end;

      { install VBL task to check time out if async write }

      err := PBWrite( ParmBlkPtr(@pPrivate^.myWBlk.theParamBlk), completor^.async );
      { handle error condition }
      if err <> noErr then
      begin
            dp^.count := 0;
            hConn^^.errCode := err;
            myWrite :=  err;
            EXIT(myWrite);
      end;
```

```
        { set the bytes write }
        { ** Be sure to have the ShortCircuit compiler variable turned on ** }
        if (pPrivate^.myWBlk.theParamBlk.ioActCount = 0)
             AND ((completor <> nil) AND completor^.async) then
        begin
              dp^.count := 0;
              hConn^^.asyncCount[cmDataOut] := 0;
        end
        else
        begin
              dp^.count := pPrivate^.myWBlk.theParamBlk.ioActCount;
              hConn^^.asyncCount[cmDataOut] := pPrivate^.myWBlk.theParamBlk.ioActCount;
        end;

        myWrite := noErr;
END;
```

cmStatusMsg

The Connection Manager will send `cmStatusMsg` to your tool when an application requires your tool to send it information about a connection.

The sample code shows how your tool can respond to `cmStatusMsg`. After executing the code necessary to respond to `cmStatusMsg`, your code should pass back both an appropriate `OsErr` or `CMErr`. Also, `p1` should contain a pointer to `CMBufferSizes`, and `p2` should contain a pointer to a variable that returns the connection status flags.

Connection status flags are a bit field, with each bit corresponding to a particular status attribute. You can find a description of the status attributes in "`CMStatus:` Getting Connection Status Information" in Chapter 3.

```
FUNCTION myStatus(hConn : ConnHandle; Var size : CMBufferSizes;
                  Var theflag : LONGINT) : CMErr;
VAR
      pPrivate     : privateptr;
      count        : LONGINT;
      err          : OSErr;

BEGIN
      pPrivate := privateptr(hConn^^.cmPrivate);
      theflag := 0;
      if (BAND(pPrivate^.status, cmStatusOpen) = 0) then  { is connection open ? }
            size[cmDataIn] := 0
      else
      begin
            err := SerGetBuf( pPrivate^.outrefnum, count );
            { Check output driver buffer }
            size[cmDataOut] := count;
            err := SerGetBuf( pPrivate^.inrefnum, count );
            { Check input driver buffer }
            size[cmDataIn] := count;
            if (count > 0) then
                  theflag := BOR(theflag, cmStatusDataAvail);
```

```
                    { Set data availabe bit }
                theflag := BOR(theflag, cmStatusOpen);
              { the connection is established }
        end;

        { set the other flags }
        if BAND(pPrivate^.status, cmStatusDRPend) = cmStatusDRPend
                then theflag := BOR(theflag, cmStatusDRPend);
        if BAND(pPrivate^.status, cmStatusDWPend)  = cmStatusDWPend
                then theflag := BOR(theflag, cmStatusDWPend);
        if BAND(pPrivate^.status, cmStatusBreakPending) = cmStatusBreakPending
                then theflag := BOR(theflag, cmStatusBreakPending);
        if BAND(pPrivate^.status, cmStatusListenPend) = cmStatusListenPend
                then theflag := BOR(theflag, cmStatusListenPend);
        myStatus := noErr;
END;
```

cmOpenMsg

Your tool's main code resource will receive `cmOpenMsg` from the Connection Manager when an application or tool requires your tool to open a connection. When passed to your tool, `p1` contains a pointer to `CMCompletorRecord`, and `p2` contains the timeout value in ticks.

The sample code shows a template into which you can code your tool's response to `cmOpenMsg`. The Connection Manager, after the connection tool passes control back to it, disposes of `CMCompletorRecord`. Therefore, your tool should copy `CMCompletorRecord` if it will need any information the record contains.

After executing the code necessary to respond to `cmOpenMsg`, your code should pass back an appropriate `OSErr` or `CMErr`.

```
FUNCTION myOpen(hConn : ConnHandle; completor : CMCompletorPtr;
                timeout : LONGINT) : CMErr;
VAR
        pPrivate      : privateptr;
        config        : configptr;
        err1,err2     : OSErr;
        theSerial     : CRMSerialPtr;
        savedState    : SignedByte;

BEGIN

        pPrivate  := privateptr(hConn^^.cmPrivate);
        config  := configptr(hConn^^.config);

        { get the CRM device info }
        theSerial  := GetSerialPtr(config^.portName);

        { check if drivers are already open
          if drivers are open, warn the application }

        {      first open output driver, then input driver }
        myOpen  := noErr;
        savedState  :=  HGetState(Handle(theSerial^.outputDriverName));
        HLock(Handle(theSerial^.outputDriverName));
        err1  := OpenDriver(theSerial^.outputDriverName^^, pPrivate^.outrefnum);
        HSetState(Handle(theSerial^.outputDriverName),savedState);
        if (err1 = 0) then                        { output opened successfully }
        begin
                savedState  :=  HGetState(Handle(theSerial^.inputDriverName));
                HLock(Handle(theSerial^.inputDriverName));
                err2  := OpenDriver(theSerial^.inputDriverName^^,
pPrivate^.inrefnum);
                HSetState(Handle(theSerial^.inputDriverName),savedState);
                if (err2 = 0) then                { input opened successfully }
                        pPrivate^.status  := cmStatusOpen
                else                              { input failed }
                begin
                        myOpen  := err2;
                        err2  := CloseDriver(pPrivate^.outrefnum); { so close output }
                end;
        end
        else myOpen := err1;

        { call completor routine here if is async open }

END;
```

cmCloseMsg

Your tool's main code resource will receive `cmCloseMsg` from the Connection Manager when an application or tool requires your tool to close a connection.

The sample code shows how your tool can respond to `cmCloseMsg`. When passed to your tool, `p1` contains a pointer to `CMCompletorRecord`, and `p2` contains the timeout value in ticks. The Connection Manager, after the connection tool passes control back to it, disposes of `CMCompletorRecord`. Therefore, your tool should copy `CMCompletorRecord` if it will need any information the record contains.

After executing the code necessary to respond to a `cmCloseMsg`, your code should pass back an appropriate `OsErr` or `CMErr`.

```
FUNCTION myClose(hConn : ConnHandle; completor : CMCompletorPtr;
                 now : LONGINT) : CMErr;
VAR
        pPrivate      : privateptr;
        err           : OSErr;

BEGIN

        pPrivate  := privateptr(hConn^^.cmPrivate);

        { is connection open ? }
        if (BAND(pPrivate^.status , cmStatusOpen) = 0) then
        begin
              myClose  :=  cmNotOpen;
              EXIT(myClose);
        end;

        { if break pending, kill break VBL }

        { if now, kill pending reads and writes
          else wait for pending reads and writes to clear }

        { close input and output drivers }
        err  :=  CloseDriver(pPrivate^.inrefnum);
        if err <> noErr then myClose := err;
        err  :=  CloseDriver(pPrivate^.outrefnum);
        if err <> noErr then myClose := err;

        { call completor routine here if is async close }

END;
```

cmBreakMsg

Your tool's main code resource will receive `cmBreakMsg` when an application or tool requires your tool to effect a break operation upon a connection.

When passed to your tool, `p1` contains `duration` in ticks, and `p2` contains a pointer to `CMCompletorRecord`.

The sample code shows how your tool can respond to `cmBreakMsg`. The Connection Manager, after the connection tool passes control back to it, disposes of `CMCompletorRecord`. Therefore, your tool should copy `CMCompletorRecord` if it will need any information the record contains.

```
FUNCTION     myBreak(hConn: ConnHandle; duration: LONGINT;
                      completor: CMCompletorPtr): CMErr;
VAR
      pPrivate     :     PrivatePtr;
      pConfig      :     ConfigPtr;
      err          :     OSErr;
      foo          :     LONGINT;

BEGIN
      myBreak      := noErr;                    {optimism}

      pPrivate     :=  PrivatePtr(hConn^^.private);
      pConfig      :=  ConfigPtr(hConn^^.config);

      if ( BAND(pPrivate^.status, cmStatusOpen) = 0 ) THEN        { not open }
      BEGIN
            myBreak :=   cmNotOpen;
            Exit(myBreak);
      END;
```

```
    IF  (pPrivate^.breakPending)  THEN        { break pending }
    BEGIN
          myBreak :=    cmNoErr;
          Exit(myBreak);
    END;

    IF  completor^.async  THEN
    BEGIN
          { do it asynchronously }
          { start the break }
          { start a timer (VBL or such) when it completes it will
                turn off the break and then call the completion routine
                if necessary }
    END
    ELSE
    BEGIN
          { start the break }
          Delay(duration,  foo);
          { end the break }
    END;
END;
```

cmIOKillMsg

Your tool's main code resource will receive `cmIOKillMsg` when a tool or application requires your tool to terminate a pending asynchronous input or output request. When passed to your tool, `p1` contains the channel that `cmIOKillMsg` should affect.

The sample code shows how your tool can respond to `cmIOKillMsg`.

```
FUNCTION myIOKill(hConn : ConnHandle; channel : INTEGER) : CMErr;
VAR
      pPrivate     :     privateptr;
      localBlk     :     HParamBlockRec;
      Err          :     OSErr;

BEGIN

      pPrivate  :=  privateptr(hConn^^.cmPrivate);

      if  (channel <> INTEGER(cmDataIn))  AND  (channel <> INTEGER(cmDataOut))  then
      begin
            myIOKill  :=  cmNotSupported;
            { can't cancel something I don't supPrivateort }
            EXIT(myIOKill);
      end;

      localBlk.ioCompletion  :=  nil;
      if  (channel  =  INTEGER(cmDataIn))       then          { cancel read }
            localBlk.ioRefNum  :=  pPrivate^.myRBlk.theParamBlk.ioRefNum
      else                                              { cancel write }
            localBlk.ioRefNum  :=  pPrivate^.myWBlk.theParamBlk.ioRefNum;
```

```
        Err  :=  PBKillIO(ParmBlkPtr(@localBlk),false);

        if  (Err  <>  noErr)  then  hConn^^.errCode  :=  Err;

        myIOKill  :=  Err;
END;
```

cmEnvironsMsg

The Connection Manager will send `cmEnvironsMsg` to your tool when an application requires your tool to send it information about the connection environment. The `ConnEnvironRec`, which contains this information, is shown here.

```
TYPE
        ConnEnvironRecPtr      =    ^ConnEnvironRec;
        ConnEnvironRec         =    PACKED  RECORD;
                version        =    INTEGER;
                baudRate       =    LONGINT;
                dataBits       =    INTEGER;
                channels       =    CMChannel;
                swFlowControl  =    BOOLEAN;
                hwFlowControl  =    BOOLEAN;
                flags          =    CMFlags;
        END;

TYPE
        CMFlags         =       INTEGER;

CONST
        cmFlagsEOM      =       $0001;

CONST
        cmData                  =       $00000001;
        cmCntl                  =       $00000002;
        cmAttn                  =       $00000004;

        cmDataClean     =       $00000100;
        cmCntlClean     =       $00000200;
        cmAttnClean     =       $00000400;

        cmNoMenus       =       $00010000;
        cmQuiet         =       $00020000;

TYPE
        CMChannel       :       INTEGER;
```

This sample code shows how your tool can respond to `cmEnvironsMsg`.

```
FUNCTION  myEnvirons(hConn:  ConnHandle;  VAR  theEnvirons:  ConnEnvironRec):
CMErr;
VAR
        pConfig:      ConfigPtr;
```

```
BEGIN
    pConfig  := ConfigPtr(hConn^^.config);     { get the config handle}
    myEnvirons  := noErr;                      { optimism }

    IF theEnvirons.version < curConnEnvRecVers THEN
        myEnvirons := envBadVers               { bad environment version }
    ELSE
    BEGIN
        IF theEnvirons.version > 1 THEN        { too advanaced for me }
            myEnvirons := envVersTooBig;       { but give it a whirl }

        WITH theEnvironsDO
        BEGIN
            dataBits  := pConfig^.dataBits;
            baudrate  := pConfig^.baudrate;
            swFlowControl  := ((pConfig^.shaker.fInX) AND
            (pConfig^.shaker.fXOn));
            hwFlowControl  := ((pConfig^.shaker.fDTR) OR
            (pConfig^.shaker.fCTS));
            flags := 0;                        { no special flags supported }
            channels := cmData;                { data channel only }
        END;
    END;
END;
```

Completion routines

When your connection tool calls `MyCompletion`, the `errCode` field of the connection record contains the appropriate error code. Because the `errCode` field of the connection record is used by all of the Connection Manager routines, the connection tool must first save the current value of the `errCode` field, and then set it to the appropriate code for the completion, call the completion routine, then restore the previously saved value. If your tool has multiple outstanding asynchronous operations, your tool should disable interrupts while the completion routine is executing.

When your tool calls the completion routine in response to the completion of an asynchronous read or write, the `asyncCount` field of the connection record contains the actual number of bytes read or written.

Quick reference

This section contains reference information for the data structures, resource names, and resource types that you need to write a connection tool. A table at the end of this section lists all the messages the Connection Manager sends to your tool, and what is passed in the parameters with each message.

Data structures

CMDataBuffer

```
TYPE
      CMDataBufferPtr     =      ^CMDataBuffer;
      CMDataBuffer        =      RECORD
            thePtr        :      Ptr;
            count         :      LONGINT;
            channel       :      CMChannel;
            flags         :      CMFlags;
      END;
```

CMCompletorRecord

```
TYPE
      CMCompletorPtr            =     ^CMCompletorRecord;
      CMCompletorRecord         =     RECORD
            async               :     BOOLEAN;
            completionRoutine   :     ProcPtr;
      END;
```

SetupStruct

```
      CMSetupPtr          =      ^CMSetupStruct;
      CMSetupStruct       =      RECORD
            theDialog     :      DialogPtr;
            count         :      INTEGER;
            theConfig     :      Ptr;
            procID        :      INTEGER
      END;
```

Resource names

```
FUNCTION       cdef(hConn: ConnHandle; msg: INTEGER; p1, p2, p3:
               LONGINT) : LONGINT;

FUNCTION       cval(hConn: ConnHandle; msg: INTEGER; p1, p2, p3:
               LONGINT) : LONGINT;

FUNCTION       cset(pSetup: CMSetupPtr; msg: INTEGER; p1, p2, p3:
               LONGINT) : LONGINT;

FUNCTION       cscr(hConn: ConnHandle; msg: INTEGER; p1, p2, p3:
               LONGINT) : LONGINT;

FUNCTION       cloc(hConn: ConnHandle; msg: INTEGER; p1, p2, p3:
               LONGINT) : LONGINT;
```

Resource types

```
type 'cbnd' {
        integer = $$CountOf(TypeArray) - 1;
        array TypeArray {
                literal longint;    /* Type   */
                integer = $$CountOf(IDArray) - 1;
                wide array IDArray {
                        integer;        /* Local ID   */
                        integer;        /* Actual ID */
                };
        };
};
```

■ **Table 9-1** Connection Manager messages and parameters

	Constant	Parameter 1 p1	Parameter 2 p2	Parameter 3 p3
Main code resource messagess				
cmInitMsg*	0	-	-	-
cmDisposeMsg	1	-	-	-
cmSuspendMsg	2	-	-	-
cmResumeMsg	3	-	-	-
cmMenuMsg*	4	menuID:Integer	menuItem:Integer	-
cmEventMsg	5	myEvent:EventRecord	-	-
cmActivateMsg	6	-	-	-
cmDeactivateMsg	7	-	-	-
cmIdleMsg	50	-	-	-
cmResetMsg	51	-	-	-
cmAbortMsg*	52	-	-	-
cmReadMsg*	100	buffer:CMDataBufferPtr	timeout:LongInt	Completor:CompletorPtr
cmWriteMsg*	101	buffer:CMDataBufferPtr	timeout:LongInt	Completor:CompletorPtr
cmStatusMsg*	102	VAR size:CMBufferSizes	VAR flags:CMStatFlags	-
cmListenMsg*	103	Completor:CMCompletorPtr	timeout:LongInt	-
cmAcceptMsg*	104	accept:Boolean	-	-
cmCloseMsg*	105	Completor:CMCompletorPtr	timeout:LongInt	-
cmOpenMsg*	106	Completor:CMCompletorPtr	timeout:LongInt	-
cmBreakMsg	107	duration:LongInt	Completor:CMCompletorPtr	-
cmIOKillMsg*	108	which:INTEGER	-	-
cmEnvironsMsg*	109	VAR theEnvirons:ConnEnvironRec	-	-
Validation code resource messages				
cmValidateMsg*	0	-	-	-
cmDefaultMsg	1	VAR cmConfigRec:Ptr	allocate:Boolean	procID:short

* Indicates the routine is a function that returns a LONGINT.

THIS CHAPTER tells you how to write the main code resource for a terminal tool. You will need to include six code resources in your tool; they are described in Chapter 8. You should read that chapter, as well as Chapter 4, before reading this chapter.

This chapter describes all the messages, parameters, and data structures that the Terminal Manager passes to your tool's main code resource. Also in this chapter is sample code (with pseudocode mixed in) that will help you understand what your tool should do when it receives any of the messages. A quick reference at the end of the chapter shows you what you should name your six terminal tool resources. It also lists the messages the Terminal Manager sends to your tool, and the parameters that the Terminal Manager passes with each message.

Your terminal tool's main code resource

The purpose of the main code resource is to parse messages from the Terminal Manager and then to branch to a routine that can handle each message. The main code resource should be a resource of type `'tdef'`, and should be able to accept the parameters shown here.

```
FUNCTION      tdef(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;
```

The accepted messages are as follows:

```
CONST
       tmInitMsg             =      0;
       tmDisposeMsg          =      1;
       tmSuspendMsg          =      2;
       tmResumeMsg           =      3;
       tmMenuMsg             =      4;
       tmEventMsg            =      5;
       tmActivateMsg         =      6;
       tmDeactivateMsg       =      7;
       tmIdleMsg             =      50;
       tmResetMsg            =      51;
       tmKeyMsg              =      100;
       tmStreamMsg           =      101;
       tmResizeMsg           =      102;
       tmUpdateMsg           =      103;
       tmClickMsg            =      104;
       tmGetSelectionMsg     =      105;
       tmSetSelectionMsg     =      106;
       tmScrollMsg           =      107;
       tmClearMsg            =      108;
       tmGetLineMsg          =      109;
       tmPaintMsg            =      110;
       tmCursorMsg           =      111;
       tmGetEnvironsMsg      =      112;
       tmDoTermKeyMsg        =      113;
       tmCountTermKeysMsg    =      114;
       tmGetIndTermKeyMsg    =      115;
```

Your tool can return an appropriate operating-system error code, or `tmNotSupported` if it does not understand the message it received.

`tmInitMsg`

The Terminal Manager will pass `tmInitMsg` to your tool after the following sequence of events occurs. When a tool or application calls `TMNew`, the Terminal Manager allocates space for the terminal record. It then fills in some of the fields, based upon information that was passed in the parameters to the call. The Terminal Manager fills in the `config` and `oldConfig` fields by calling `TMDefault`. Then the Terminal Manager passes `tmInitMsg` to your tool. After your tool has finished responding to `tmInitMsg`, the Terminal Manager calls `TMValidate`.

```
BEGIN
      theChar  :=  CHAR( BAND( myEvent.message,  charCodeMask) );
      theKeyCode  :=  CHAR( BAND( myEvent.message,  keyCodeMask)  );
      theModifier  :=  myEvent.modifiers  ;

      theState  :=  HGetState( Handle( hTerm)  )  ;
      HLock( Handle( hTerm)  )  ;
      With  hTerm^^  Do
      Begin
            {  do  special  keyboard  mapping  if  the  keycode  isn't  -1  }
            {  if  keycode  is  -1,  that  is,  fake  keyDown  event  }

            {  transmit  data  if  the  terminal  is  online  }

            {  echo  data  to  the  screen  if  online  is  off  or  localecho  is  true  }
      END;
      HSetState(  Handle(hTerm),  theState);
END;
```

tmStreamMsg

The Terminal Manager will pass `tmStreamMsg` to your tool when the application has requested the `TMStream` routine. When passed to your tool, `p1` will point to the buffer of incoming data; `p2` will contain the length of the buffer in bytes; and `p3` will contain `flags`, which the application passed to `TMStream`. The sample code shows a template into which you can code your tool's response to `tmStreamMsg`.

After executing the code necessary to respond to a `tmStreamMsg`, your tool should return the number of characters it processed.

```
FUNCTION  TermToolStream(hTerm:  TermHandle;  theBuffer:  Ptr;
                              theBufferSize:LONGINT  ;  flag:  CMFlags):LONGINT;
VAR
      theState      :      SignedByte;
      thePtr        :      Ptr;
      i             :      INTEGER;
      privatePtr    :      TERMINALPrivatePtr  ;

BEGIN
      theState  :=  HGetState( Handle( hTerm)  )  ;
      HLock( Handle( hTerm)  )  ;
      With  hTerm^^  Do
      Begin
            {  do  special  handling  if  flag  is  equal  to  EOM  }

            privatePtr  :=  TERMINALPrivatePtr(  tmPrivate);
            With  privatePtr^  Do
            BEGIN
                  thePtr   :=  tmprivatetermbuffer;
                  thePtr   :=  Ptr(  Ord(thePtr)  +
                                    tmprivatecurrentrow  *  tmprivatecurrentcol);
                  FOR i    :=  1  TO  theBufferSize  DO
```

```
                BEGIN
                    { process data in theBuffer, such as moving the
                      cursor position, etc. }

                    { if data in theBuffer isn't a special escape sequence }
                    { assign data into our private terminal tool buffer }

                    thePtr := Ptr( LONGINT( theBuffer ) + i);
                    { advance tmprivatecurrentcol }
                    tmprivatecurrentcol := tmprivatecurrentcol + 1;
                END;

                { return the number of chars we have processed }
                TermToolStream := LONGINT( theBufferSize);
            END;
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmActivateMsg and **tmResumeMsg**

Your tool will receive `tmActivateMsg` when the application requires your tool to process an activate event (such as inserting menus into the menu bar, modifying a selection, or making the cursor blink) for a window that belongs to the Terminal Manager. The sample code shows a template into which you can code your tool's response to `tmActivateMsg`.

Your tool receives `tmResumeMsg` from the Terminal Manager when the application returns to the foreground in MultiFinder. Your tool can call the same routine in response to receiving `tmResumeMsg` as it calls in response to receiving `tmActivateMsg`.

```
PROCEDURE TermToolActivate( hTerm:TermHandle);
VAR
        privatePtr   :      TERMINALPrivatePtr;
        theState     :      SignedByte;
BEGIN
        theState := HGetState( Handle( hTerm));
        HLock( Handle( hTerm) );
        With hTerm^^ Do
        Begin
            privatePtr := TERMINALPrivatePtr( tmPrivate);

            { turn on the selection if there's any }
            IF NOT EmptyRect( selection.selRect ) THEN
                HiliteSelection( hTerm);

            { put up my tool's menu if tmNoMenus isn't true }
            IF ( BAND( flags, tmNoMenus ) = 0 ) THEN
```

```
PROCEDURE  TermToolUpdate(  hTerm:TermHandle  ;  visRgn:RgnHandle);
VAR
        theState      :      SignedByte;
BEGIN
        theState  :=  HGetState(  Handle(  hTerm)  )  ;
        HLock(  Handle(  hTerm)  )  ;
        With  hTerm^^  Do
        Begin
                {  redraw  the  terminal  area.  The  area  to  be  drawn  is  specified  by  }
                {  the  region  handle  passed  in.  }
        End;
        HSetState(  Handle(hTerm),  theState);
END;
```

tmClickMsg

Your tool will receive `tmClickMsg` from the Terminal Manager when the application requires your tool to handle a mouse-down event in the terminal emulation window; it should respond by calling the application's click-loop procedure. Your tool should support placing and dragging the cursor. When passed to your tool, `p1` will contain a pointer to the event record.

The sample code shows a template into which you can code your tool's response to `tmClickMsg`.

```
PROCEDURE  TermToolClick(  hTerm:TermHandle  ;  myEvent:Eventrecord);
VAR
        theState            :      SignedByte;
        clickInCachArea     :      Boolean;
BEGIN
        theState  :=  HGetState(  Handle(  hTerm)  )  ;
        HLock(  Handle(  hTerm)  )  ;
        clickInCachArea  :=  FALSE  ;
        With  hTerm^^  Do
        Begin
                {  call  the  clickloop  if  there's  any  }
                if  clikLoop  <>  NIL  THEN
                BEGIN
                        clickInCachArea  :=  CallclikLoop(  refCon,  clikLoop  );
                END;
                if  NOT  clickInCachArea  THEN
                BEGIN
                        {  mouse  click  is  in  the  terminal  area,  track  mouse  }
                END;
        End;
        HSetState(  Handle(hTerm),  theState);
END;
```

tmMenuMsg

Your tool will receive `tmMenuMsg` from the Terminal Manager when the user has chosen an item from a menu that belongs to your terminal tool. When passed to your tool, `p1` will contain the menu ID, and `p2` will contain the menu item. The sample code shows a template into which you can code your tool's response to `tmMenuMsg`.

After your tool has handled `tmMenuMsg`, it should return 0 if it did not handle the menu event, and 1 if it did.

```
FUNCTION TermToolMenu( hTerm:TermHandle ; menuID, menuItem:INTEGER ):LONGINT;
VAR
	theState	:	SignedByte;
	privatePtr	:	TERMINALPrivatePtr;
BEGIN
	theState := HGetState( Handle( hTerm) ) ;
	HLock( Handle( hTerm) ) ;
	With hTerm^^ Do
	BEGIN
		privatePtr := TERMINALPrivatePtr( tmPrivate );
		With privatePtr^ Do
		BEGIN
			{ does the menuID belong to the terminal? }
			IF menuID = tmprivateMenuID THEN
			BEGIN
				{ yes, it's one of ours, handle it based on the menuItem }

				{ unhilite the menu title }
				HiliteMenu( tmprivateMenuID );
				{ if the menu belongs to the terminal tool, return 1 }
				TermToolMenu := 1 ;
			END
			ELSE
			{ if the menu doesn't belong to the terminal tool, return 0 }
				TermToolMenu := 0 ;
		END;
	END;
	HSetState( Handle(hTerm), theState);
END;
```

tmGetSelectionMsg

Your tool needs to be able to handle `tmGetSelectionMsg` to support cut and copy operations in the terminal emulation window. The sample code shows a template into which you can code your tool's response to `tmGetSelectionMsg`.

After responding to `tmGetSelectionMsg`, your tool should resize the data block (the passed-in handle) by calling `SetHandleSize (p1, newSize)`, and a pointer to the scrap type (`ResType`) in `p3`. Your tool should also return an error code, if appropriate; zero if there was no selection; or the size of the selected data.

```
FUNCTION  TermToolGetSelection(  hTerm:TermHandle  ;  DataHandle:Handle;
                                  VAR  selResType:ResType):LONGINT;
VAR
       theState      :      SignedByte;
       datasize      :      LONGINT;
BEGIN
       theState  :=  HGetState(  Handle(  hTerm)  )  ;
       HLock(  Handle(  hTerm)  )  ;
       With  hTerm^^  Do
       BEGIN
              IF  NOT  EmptyRect(  selection.selRect  )  THEN
              BEGIN
                     {  there's  a  selection  }

                     {  calculate  the  size  of  the  selection  }
                     datasize  :=  GetSelectionSize(  hTerm);
                     {  grow  DataHandle  according  to  the  size  }
                     SetHandleSize(DataHandle,  datasize  );
                     {  copy  the  data  into  DataHandle  }

                     selResType  :=  'TEXT';
                     TermToolGetSelection  :=  datasize  ;
              END
              ELSE
                     {  there's  no  selection  }
                     TermToolGetSelection  :=  0  ;
       END;
       HSetState(  Handle(hTerm),  theState);
END;
```

tmSetSelectionMsg

An application will call `TMSetSelection` when it requires your tool to highlight an area of the terminal emulation window. When passsed to your tool, `p1` will point to the field that needs to be highlighted, and `p2` will describe the type of selection. The example code shows a template into which you can code your tool's response to `tmSetSelectionMsg`.

```
PROCEDURE  TermToolSetSelection(  hTerm:TermHandle  ;  mySelection:TMSelection;
                                  myselType:LONGINT);
VAR
       theState      :      SignedByte;
BEGIN
       theState  :=  HGetState(  Handle(  hTerm)  )  ;
       HLock(  Handle(  hTerm)  )  ;
       With  hTerm^^  Do
       BEGIN
              IF  NOT  EmptyRect(  selection.selRect  )  THEN
                     {  dehilite  old  selection  if  there's  any  }
                     DeHiliteSelection(  hTerm);
              {  assign  new  selection  record  to  the  terminal  record  }
              selection  :=  mySelection  ;
              selType  :=  myselType;
```

```
            HiliteSelection( hTerm );
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmScrollMsg

An application will call `tmScroll` when it requires your tool to scroll the terminal emulation region either horizontally or vertically. (The application is responsible for scrolling the cache area, if it supports one.) When passed to your tool, `p1` will contain the amount of horizontal scrolling, and `p2` will contain the amount of vertical scrolling. The example code shows a template into which you can code your tool's response to `tmScrollMsg`.

```
PROCEDURE TermToolScroll( hTerm:TermHandle; deltaH, deltaV:LONGINT );
VAR
        theState    :     SignedByte;
        updatergn   :     RgnHandle;
BEGIN
        theState := HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
            updatergn := NewRgn;
            ScrollRect( viewRect, deltaH, deltaV, updatergn );
            { update the newly scrolled in area }
            DisposeRgn( updatergn);
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmResetMsg

Your tool will receive `tmResetMsg` when the application requires your tool to reset the terminal emulation window. This reset operation should purge all local screen buffers, be a local operation, and call the cache procedure if `tmSaveBeforeClear` is set in the terminal record.

The code sample shows a template into which you can code your tool's response to `tmResetMsg`.

```
PROCEDURE TermToolReset( hTerm:TermHandle );
VAR
        theState    :     SignedByte;
        error       :     Boolean;
BEGIN
        theState := HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
            { clear the screen }
            TermToolClear( hTerm );
            { copy the saved configuration into the current configuration record }
            BlockMove( oldConfig, config, sizeof( ToolConfigRecord) );
            { call the validate routine to update my tool's private record }
            error  :=  TMValidate( hTerm);
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmClearMsg

Your tool will receive `tmClearMsg` when the application needs your tool to clear the terminal emulation window. This clear operation should purge all local screen buffers, be a local operation, and call the cache procedure if `tmSaveBeforeClear` is set in the terminal record.

The code sample shows a template into which you can code your tool's response to `tmClearMsg`.

```
PROCEDURE  TermToolClear( hTerm:TermHandle );
VAR
        theState     :      SignedByte;
BEGIN
        theState  :=  HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
              { erase the screen }
              EraseRect( viewRect );
              { clear up the terminal buffer }

        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmGetLineMsg

An application will call `TMGetline` when it requires your tool to send it a `TermDataBlock`, which contains the data, character attributes, and line attributes. For example, the application might require the data in `TermDataBlock` to update its cache area for a specified line. When passed to your tool, `p1` contains the line number, and `p2` points to the `TermDataBlock`, which your tool should fill in.

The sample code shows a template into which you can code your tool's response to `tmGetLineMsg`. Your tool should fill the `TermDataBlock` with new information and resize the `theTermData.theData` handle for the requested line.

```
PROCEDURE  TermToolGetLine( hTerm:TermHandle ; lineNo:LONGINT ;
                            VAR myTermBlock:TermDataBlock);
VAR
        theState     :      SignedByte;
BEGIN
        theState  :=  HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
              myTermBlock.flags  :=  tmTextTerminal;    { this is a text terminal }
              myTermBlock.auxData  :=  NIL;             { no style information }
```

```
                { grow the datahandle size to fit a line of data }
                SetHandleSize( myTermBlock.theData, MAXCOL );
                { copy the terminal content into myTermBlock.theData }
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmPaintMsg

An application will call `TMPaint` when it requires your tool to display the contents of a `TermDataBlock`. When passed to your tool, `p1` will point to the `TermDataBlock`, and `p2` will point to the rectangle into which your tool is to display the line.

If `theTermData.theData` is a handle to plain text (not styled), your tool can calculate the number of characters to paint by calling `GetHandleSize`. If your tool requires the data in `theTermData` after it passes control back to the calling application, it must make a copy of this data, since the application may change or destroy `TermDataBlock`.

The sample code shows a template into which you can code your tool's response to `tmPaintMsg`.

```
PROCEDURE TermToolPaint( hTerm:TermHandle; theTermData:TermDataBlock; drawRect:Rect );
VAR
        theState     :     SignedByte;
BEGIN
        theState := HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
                { given the terminal data block, redraw those contents }
                { within the boundaries of the given rectangle }
        END;
        HSetState( Handle(hTerm), theState);
END;
```

tmCursorMsg

An application will call `TMCursor` when it requires your tool to pass it the current location of the cursor. When passed to your tool, `p1` will specify the type of cursor.

The sample code shows a template into which you can code your tool's response to `tmCursorMsg`. Your tool should return the current cursor position.

```
FUNCTION TermToolCursor( hTerm:TermHandle; cursorType: TMCursorTypes ):LONGINT;
VAR
        theState     :     SignedByte;
        privatePtr   :     TERMINALPrivatePtr;
BEGIN
        theState := HGetState( Handle( hTerm) ) ;
        HLock( Handle( hTerm) ) ;
        With hTerm^^ Do
        BEGIN
                privatePtr := TERMINALPrivatePtr( tmPrivate );
```

```
            { return row and col if cursorType is text cursor }
            IF cursorType = cursorText THEN
                  TermToolCursor := LONGINT( privatePtr^.tmprivatecursor) ;
            { else return pixels if cursorType is graphic cursor }
      END;
      HSetState( Handle(hTerm), theState);
END;
```

tmGetEnvironsMsg

Your tool will receive `tmGetEnvironsMsg` when the application has called the `TMGetTermEnvirons` routine. When passed to your tool, `p1` will point to the `TermEnvironRec`. Your tool should fill in this record.

The sample code shows a template into which you can code your tool's response to `tmGetEnvironsMsg`.

```
FUNCTION TermToolGetEnvirons( hTerm:TermHandle ;
                              VAR myTermEnvRec:TermEnvironRec):LONGINT;
VAR
      theState     :     SignedByte;
      privatePtr   :     TERMINALPrivatePtr;
BEGIN
      theState := HGetState( Handle( hTerm) ) ;
      HLock( Handle( hTerm) ) ;
      With hTerm^^, myTermEnvRec Do
      BEGIN
            privatePtr := TERMINALPrivatePtr( tmPrivate );
            { return error if the given version number isn't the
              same as the current version }
            IF version > curTermEnvRecVers THEN
                  TermToolGetEnvirons := envVersTooBig
            ELSE IF version < curTermEnvRecVers THEN
                  TermToolGetEnvirons := envBadVers
            ELSE BEGIN
                  termType := tmTextTerminal ;     { it's a text terminal }
                  textRows := MAXROW;
                  textCols := MAXCOL;
                  cellSize.h := privatePtr^.tmprivatecellsize.h;
                  cellSize.v := privatePtr^.tmprivatecellsize.v;
                  slop.h := THESLOP;
                  slop.v := THESLOP;
                  SetRect( graphicSize, 0, 0, 0, 0 );
                  SetRect( auxSpace, 0, 0, 0, 0 );
                  { return no error }
                  TermToolGetEnvirons := 0;
            END;
      END;
      HSetState( Handle(hTerm), theState);
END;
```

tmEventMsg

The Terminal Manager will pass `tmEventMsg` to your tool when an event occurs in a window associated with the terminal tool. The sample code shows a template into which you can code your tool's response to `tmEventMsg`. When passed to your tool, `p1` will be a pointer to the event record.

```
PROCEDURE TermToolEvent( hTerm:TermHandle ; myEventRecord:EventRecord);
VAR
      theState     :     SignedByte;
BEGIN
      theState := HGetState( Handle( hTerm) ) ;
      HLock( Handle( hTerm) ) ;
      With hTerm^^ Do
      BEGIN
            { an event has been received for a window or dialog box that was }
            { created by the terminal tool, process it accordingly. }
            CASE myEventRecord.what OF
                        mouseDown:
                              ;
                        keyDown, autoKey:
                              ;
                        updateEvt:
                              ;
                        activateEvt:
                              ;
                        END;
      END;
      HSetState( Handle(hTerm), theState);
END;
```

tmDoTermKeyMsg

Your tool will receive `tmDoTermKeyMsg` when the application has called the `TMDoTermKey` routine. When passed to your tool, `p1` will point to a string that corresponds to the key that was pressed. For example, if the user pressed the PF1 key, the string will be "PF1." If there is no key that corresponds to the string, your tool should do nothing.

The sample code shows a template into which you can code your tool's response to `tmDoTermKeyMsg`.

```
PROCEDURE TermToolDoTermKey( hTerm:TermHandle ; theStr: StringPtr );
VAR
      theState     :     SignedByte;
BEGIN
      theState := HGetState( Handle( hTerm) ) ;
      HLock( Handle( hTerm) ) ;
      With hTerm^^ Do
      BEGIN
            { perform the action determined by the special
            terminal key passed in, e.g HOME, PF1 etc.,
            and ignore theStr if it's not recognized by the terminal tool }
      END;
      HSetState( Handle(hTerm), theState);
END;
```

tmCountTermKeysMsg

Your tool will receive `tmCountTermKeysMsg` when the application requires your tool to pass it the number of special terminal key names that it supports.

The sample code shows how your tool can respond to `tmCountTermKeysMsg`.

```
FUNCTION  TermToolCountTermKey(  hTerm:TermHandle  ):LONGINT;
VAR
       theState      :      SignedByte;
BEGIN
       theState := HGetState( Handle( hTerm) ) ;
       HLock( Handle( hTerm) ) ;
       With hTerm^^ Do
       BEGIN
              { return the number of special terminal keys
                supported by the termainl tool }
       END;
       HSetState( Handle(hTerm), theState);
END;
```

tmGetIndTermKeyMsg

The Terminal Manager will pass `tmGetIndTermKeyMsg` to your tool when the application requires your tool to pass it the name of a special terminal key (for example, PF1, PA1, or DUP). When passed to your tool, `p1` contains the index (number) of the key.

The code sample shows a template into which you can code your tool's response to `tmGetIndTermKeyMsg`. When your tool is done, it should pass back a pointer to a Str255 return value that describes the key, or a pointer to an empty string if the index is invalid.

```
PROCEDURE  TermToolGetIndTermKey(hTerm:TermHandle;  index:INTEGER;  VAR  theStr:STR255);
VAR
       theState      :      SignedByte;
BEGIN
       theState := HGetState( Handle( hTerm) ) ;
       HLock( Handle( hTerm) ) ;
       With hTerm^^ Do
       BEGIN
              { return the terminal key supported by the terminal tool in theStr }
              { or return empty string if index is out of range }
       END;
       HSetState( Handle(hTerm), theState);
END;
```

Quick reference

This section contains reference information for the data structures, resource names, and resource types that you need to write a terminal tool. A table at the end of this section lists all the messages the Terminal Manager sends to your tool, and what is passed in the parameters with each message.

Data structures

TMSetupStruct

```
TYPE
      TMSetupPtr         =      ^TMSetupStruct;
      TMSetupStruct      =      RECORD
            theDialog    :      DialogPtr;
            count        :      INTEGER;
            theConfig    :      Ptr;
            procID       :      INTEGER
      END;
```

TMSearchBlock

```
TYPE
      TMSearchBlockPtr   =      ^TMSearchBlock;
      TMSearchBlock      =      RECORD;
            theString    :      StringHandle;
            where        :      Rect;
            searchType   :      TMSearchTypes;
            callBack     :      ProcPtr;
            refnum       :      INTEGER;
            next         :      TMSearchBlockPtr;
      END;
```

Resource names

```
FUNCTION      tdef(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;

FUNCTION      tval(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;

FUNCTION      tset(pSetup: SetupPtr; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;

FUNCTION      tscr(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;

FUNCTION      tloc(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
              LONGINT) : LONGINT;
```

Resource Types

```
type 'tbnd' {
       integer = $$CountOf(TypeArray) - 1;
       array TypeArray {
              literal longint;          /* Type */
              integer = $$CountOf(IDArray) - 1;
              wide array IDArray {
                     integer;           /* Local ID  */
                     integer;           /* Actual ID  */
              };
       };
};

type 'tver' as 'vers';
```

■ **Table 10-1** Terminal Manager messages and parameters

	Constant	Parameter 1 `p1`	Parameter 2 `p2`	Parameter 3 `p3`
Validation code resource messages				
`tmValidateMsg*`	0	-	-	-
`tmDefaultMsg`	1	`VAR termConfigRec:Ptr`	`allocate:Boolean`	`procID:short`
SetUp code resource messages				
`tmSpreflightMsg*`	0	-	-	`VAR magicCookie:LONGINT`
`tmSsetupMsg`	1	-	-	`VAR magicCookie:LONGINT`
`tmSitemMsg`	2	`VAR item:itemSelected`	-	`VAR magicCookie:LONGINT`
`tmSfilterMsg*`	3	`myEvent:EventRecord`	`VAR item:itemHit`	`VAR magicCookie:LONGINT`
`tmScleanupMsg`	4	-	-	`VAR magicCookie:LONGINT`
Scripting code resource messages				
`tmMgetMsg*`	0	-	-	-
`tmMsetMsg*`	1	`configPtr:Ptr`	-	-
Localization code resource messages				
`tmL2English*`	0	`inputPtr:Ptr`	`VAR outputPtr:Ptr`	`fromLanguage:integer`
`tmL2Intl*`	1	`inputPtr:Ptr`	`VAR outputPtr:Ptr`	`toLanguage:integer`

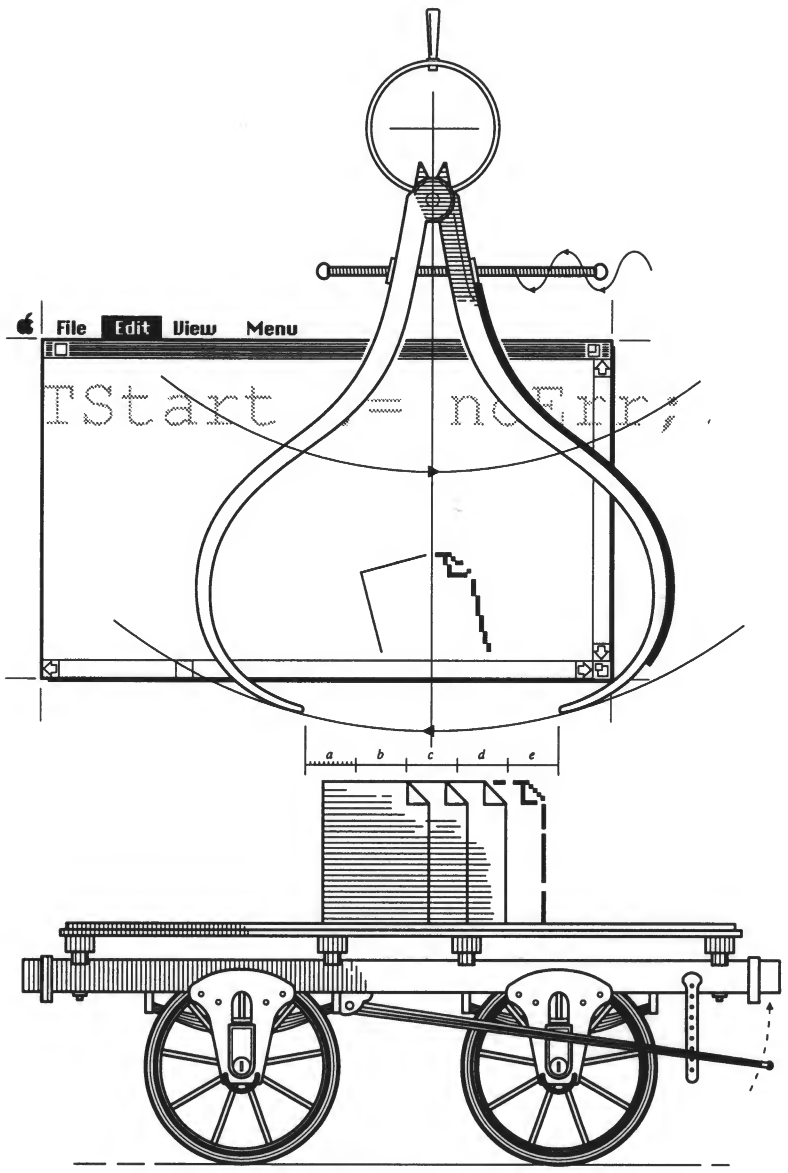
* Indicates the routine is a function that returns a `LONGINT`.

■ **Table 10-1** Terminal Manager messages and parameters (continued)

	Constant	Parameter 1 `p1`	Parameter 2 `p2`	Parameter 3 `p3`
Main code resource messages				
`tmInitMsg*`	0	-	-	-
`tmDisposeMsg`	1	-	-	-
`tmSuspendMsg`	2	-	-	-
`tmResumeMsg`	3	-	-	-
`tmMenuMsg*`	4	`menuID:Integer`	`menuItem:Integer`	-
`tmEventMsg`	5	`myEvent:EventRecord`	-	-
`tmActivateMsg`	6	-	-	-
`tmDeactivateMsg`	7	-	-	-
`tmIdleMsg`	50	-	-	-
`tmResetMsg`	51	-	-	-
`tmKeyMsg`	100	`myEvent:EventRecord`	-	-
`tmStreamMsg*`	101	`bufferPtr:Ptr`	`bufferSize:LontInt`	`flags:CMFlags`
`tmResizeMsg`	102	`newTermRect:Rect`	-	-
`tmUpdateMsg`	103	`visRgn:RgnHandle`	-	-
`tmClickMsg`	104	`myEvent:EventRecord`	-	-
`tmGetSelectionMsg*`	105	`dataHandle:Handle`	`VAR selTypes:TMSelTypes`	-
`tmSetSelectionMsg`	106	`theSelection:TMSelection`		
`tmScrollMsg`	107	`deltaH:Integer`	`deltaV:Integer`	-
`tmClearMsg`	108	-	-	-
`tmGetLineMsg`	109	`lineNo:Integer`	`VAR myTermBlock:TermDataBlock`	-
`tmPaintMsg`	110	`myTermBlock:TermDataBlock`	`paintRect:Rect`	-
`tmCursorMsg*`	111	`cursorTypes:TMCursorTypes`	-	-
`tmGetEnvironsMsg*`	112	`VAR   TermEnv:TermEnvironRec`	-	-
`tmDoTermKeyMsg*`	113	`termKey:Str255`	-	-
`tmCountTermKeysMsg*`	114	-	-	-
`tmGetIndTermKeyMsg`	115	`index:Integer`	`VAR termKey:Str255`	-

* Indicates the routine is a function that returns a `LONGINT`.

Chapter 11 **Writing File-Transfer Tools**



THIS CHAPTER tells you how to write the main code resource for a file transfer tool. You will need to include five other code resources as part of your tool; they are described in Chapter 8. You should also read that chapter, as well as Chapter 5, before reading this chapter.

This chapter describes all the messages, parameters, and data structures that the File Transfer Manager passes to your tool's main code resource. Also in this chapter is sample code (with pseudocode mixed in) that will help you understand what your tool should do when it receives any of the messages. A quick reference at the end of the chapter shows you what you should name your six file transfer tool resources. It also lists the messages the File Transfer Manager sends to your tool, and the parameters that the File Transfer Manager passes with each message.

Your file transfer tool's main code resource

The purpose of the main code resource is to parse messages from the File Transfer Manager and then to branch to a routine that can handle each message. The main code resource should be a resource of type `'fdef'` and should be able to accept the parameters shown here.

```
FUNCTION     fdef(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;
```

The accepted messages are as follows:

```
CONST
       ftInitMsg          =     0;
       ftDisposeMsg       =     1;
       ftSuspendMsg       =     2;
       ftResumeMsg        =     3;
       ftMenuMsg          =     4;
       ftEventMsg         =     5;
       ftActivateMsg      =     6;
       ftDeactivateMsg    =     7;
       ftAbortMsg         =     52;
       ftStartMsg         =     100;
       ftExecMsg          =     102;
```

For each of the messages defined above, the three parameters that `'fdef'` returns, namely `p1`, `p2`, and `p3`, take on different meanings. These meanings are described in the message descriptions that follow. Your tool can return an appropriate operating-system error code, or `ftNotSupported` if it does not understand the message it received.

ftInitMsg

The File Transfer Manager will pass `ftInitMsg` to your tool after the following sequence of events occurs. When a tool or application calls `FTNew`, the File Transfer Manager allocates space for the file transfer record. It then fills in some of the fields, based upon information that was passed in the parameters to the call. The File Transfer Manager fills in the `config` and `oldConfig` fields by calling `FTDefault`. Then the File Transfer Manager passes `ftInitMsg` to your tool. After your tool has finished responding to `ftInitMsg`, the File Transfer Manager calls `FTValidate`.

After executing the code necessary to respond to `ftInitMsg`, your code should pass back an appropriate `OsErr` or `FTErr`. Here's an example:

```
FUNCTION     myInit(hFT: FTHandle): CMErr;
VAR
       state  :      SignedByte;

BEGIN
       myInit := noErr;                         { optimism }
       state := HGetState(Handle(hFT));         { save handle state }
       HLock(Handle(hFT));                      { lock it down }

       WITH hFT^^ DO
```

```
      BEGIN
            errCode := noErr;                 { optimism reigns }

            private := PrivatePtr(NewPtr(SIZEOF(PrivateData)));
            WITH private^ DO
            BEGIN  { fill in private data structure here }
            END;
      END;

      HSetState(Handle(hFT), state);
END;
```

ftDisposeMsg

A tool or application will call `FTDispose` when it must dispose of a file transfer record and its associated data structures.

The File Transfer Manager passes `ftDisposeMsg` to your tool before disposing of the `config` and `oldConfig` fields of the file transfer record. Next, the File Transfer Manager disposes of the file transfer record.

To handle `ftDisposeMsg`, your tool should dispose of any buffers allocated in response to `ftInitMsg` and any private data storage (referenced off of `ftPrivate` in the file transfer record). Your tool must not attempt to dispose of either `config` or `oldConfig` in the file transfer record, or of the file transfer record itself. Doing so will cause a system crash.

The sample code shows a template into which you can code your tool's response to `ftDisposeMsg`.

```
PROCEDURE myDispose(hFT: FTHandle);
VAR
      err: FTErr;

BEGIN
      { abort FT in progress }
      { do cleanup }
      DisposPtr( Ptr(hFT^^.private) );
END;
```

ftStartMsg

Your tool will receive `ftStartMsg` from the File Transfer Manager when the application requires your tool to start a file transfer. The sample code shows a template into which you can code your tool's response to `ftStartMsg`.

Your tool should pass back the appropriate error message if unable to start the file transfer.

```
FUNCTION FTStartup(hFT: FTHandle): FTErr;
BEGIN
      FTStart := noErr;                           { optimism }

      WITH hFT^^ DO
      BEGIN
            errCode := 0;
            flags := BOR(flags, ftIsFTMode);      { file transfer in progress }
```

```
                { initialize the variable }
                { open file }
                { prepare your I/O buffer }
                { draw the status dialog }

        END;

END;
```

ftExecMsg

An application calls `FTExec` to provide time for a file transfer in progress. Your tool should strive to be "MultiFinder-friendly" by minimizing the time it spends handling this message. When the file transfer is completed, your tool should close all files and dispose of any status dialog boxes.

```
PROCEDURE FTExec(hFT: FTHandle);
BEGIN
        { called when file transfer is in progress so do your
                stuff here...}
END;
```

ftAbortMsg

Your tool will receive `ftAbortMsg` from the File Transfer Manager when the application requires your tool to abort a file transfer. The sample code provides a template into which you can code your tool's response to `ftAbortMsg`.

If your tool is unable to abort successfully, it should pass back an appropriate error code.

```
FUNCTION FTAbort(hFT: FTHandle): FTErr;
BEGIN
        { abort the file transfer in progress here }
        { close the file }
        { dispose of the status dialog }
END;
```

ftActivateMsg and **ftResumeMsg**

Your tool will receive `ftActivateMsg` or `ftResumeMsg` when the application requires your tool to process an activate event (such as inserting menus into the menu bar). The sample code shows a template into which you can code your tool's response to `ftActivateMsg` or `ftResumeMsg`.

```
PROCEDURE myActivate(hFT: FTHandle);
BEGIN

END;
{
        p1, p2, p3 are ignored

        This routine may perform actions such as inserting a menu into the
        menu bar.
}
```

```
PROCEDURE myResume(hFT: FTHandle);
BEGIN

END;

{
      p1, p2, p3 are ignored

      This routine may perform the same actions as myActivate
}
```

`ftDeactivateMsg` and `ftSuspendMsg`

Your tool will receive `ftDeactivateMsg` or `ftSuspendMsg` when the application requires your tool to process a deactivate event (such as removing a menu from the menu bar) for a window that belongs to the File Transfer Manager.

`ftMenuMsg`

The File Transfer Manager will send `ftMenuMsg` to your tool when a menu event has occurred in the application. When passed to your tool, `p1` will contain the menu ID, and `p2` will contain the menu item.

The sample code shows a template into which you can code your tool's response to `ftMenuMsg`. When done, your tool should pass back 0 if the menu event was not handled, and 1 if it was.

```
FUNCTION myMenu(hFT: FTHandle; mID: INTEGER; mItem: INTEGER):
LONGINT;
BEGIN
      myMenu := 0;                    { pessimism }
      { if mine then
            myMenu := 1;              { handle the menu event }
      }
END;
```

`ftEventMsg`

Your tool will receive `ftEventMsg` from the File Transfer Manager when an event has occurred in the application. When passed to your tool, `p1` will point to the event record, in which the reference constant field contains the file transfer handle.

Quick reference

This section contains reference information for the resource names, and resource types that you need to write a file transfer tool. A table at the end of this section lists all the messages the File Transfer Manager sends to your tool, and what is passed in the parameters with each message.

Resource names

```
FUNCTION     fdef(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;

FUNCTION     fval(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;

FUNCTION     fset(pSetup: FTSetupPtr; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;

FUNCTION     fscr(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;

FUNCTION     floc(hTerm: TermHandle; msg: INTEGER; p1, p2, p3:
             LONGINT) : LONGINT;
```

Resource types

```
type 'fbnd' {
        integer = $$CountOf(TypeArray) - 1;
        array TypeArray {
                literal longint;            /* Type */
                integer = $$CountOf(IDArray) - 1;
                wide array IDArray {
                        integer;            /* Local ID  */
                        integer;            /* Actual ID */
                };
        };
};
```

■ **Table 11-1** File Transfer Manager messages and parameters

	Constant	Parameter 1 p1	Parameter 2 p2	Parameter 3 p3
Main code resource messages				
`ftInitMsg*`	0	-	-	-
`ftDisposeMsg`	1	-	-	-
`ftSuspendMsg`	2	-	-	-
`ftResumeMsg`	3	-	-	-
`ftMenuMsg*`	4	`menuID:Integer`	`menuItem:Integer`	-
`ftEventMsg`	5	`myEvent:EventRecord`	-	-
`ftActivateMsg`	6	-	-	-
`ftDeactivateMsg`	7	-	-	-
`ftAbortMsg*`	52	-	-	-
`ftStartMsg*`	100	-	-	-
`ftExecMsg`	102	-	-	-
Validation code resource messages				
`ftValidateMsg*`	0	-	-	-
`ftDefaultMsg`	1	`VAR ftConfigRec:Ptr`	`allocate:Boolean`	`procID:short`
SetUp code resource messages				
`ftSpreflightMsg*`	0	-	-	`VAR magicCookie:LONGINT`
`ftSsetupMsg`	1	-	-	`VAR magicCookie:LONGINT`
`ftSitemMsg`	2	`VAR item:itemSelected`	-	`VAR magicCookie:LONGINT`
`ftSfilterMsg*`	3	`myEvent:EventRecord`	`VAR item:itemHit`	`VAR magicCookie:LONGINT`
`ftScleanupMsg`	4	-	-	`VAR magicCookie:LONGINT`
Scripting code resource messages				
`ftMgetMsg*`	0	-	-	-
`ftMsetMsg*`	1	`configPtr:Ptr`	-	-
Localization code resource messages				
`ftL2English*`	0	`inputPtr:Ptr`	`VAR outputPtr:Ptr`	`fromLanguage:integer`
`ftL2Intl*`	1	`inputPtr:Ptr`	`VAR outputPtr:Ptr`	`toLanguage:integer`

* Indicates the routine is a function that returns a `LONGINT`.

Appendix A **Guidelines for Communications Tools**

THIS APPENDIX contains software design and human interface guidelines for communications tools. The guidelines presented in this appendix, while not hard-and-fast rules, will help ensure that your tool works with future releases of the Communications Toolbox, with other tools, and with applications that use the Communications Toolbox.

This appendix discusses the design goals your tool should implement. Then it discusses human interface considerations. Finally, the appendix describes hardware and software compatibility requirements.

To fully understand this appendix, you should first read Chapter 8, "Fundamentals of Writing Your Own Tool," and at least one of the following chapters: Chapter 9, "Writing Connection Tools"; Chapter 10, "Writing Terminal Tools"; or Chapter 11, "Writing File Transfer Tools."

Design goals

When you design your tool keep these goals in mind. Your tool should be

- **Self-contained:** It should contain all the resources it needs in its bundle resource, and not need to make use of other tools or applications.
- **Task-specific:** It should be a connection tool, a terminal tool, or a file-transfer tool. It should respond to all the messages that the manager sends to it, but not to any messages that a Communications Toolbox manager intends a different tool to respond to. For instance, a terminal tool should not respond to Connection Manager messages and should not implement or maintain a data connection.

Keeping your tool self-contained

For users, installing a communications tool should be as simple as dragging the icon for that tool into the folder named *Communications Folder* on the desktop. To achieve this level of simplicity, your tool must be self-contained; all the resources it needs for proper operation must be in the resource bundle.

There are, however, two exceptions to this principle. The first is when your tool uses a hardware interface that requires a driver to be loaded at INIT time, an unavoidable circumstance. The second exception is when your tool provides access to special data files (for example, a file of network addresses) that are kept on the user's system. Such data files provide your tool with a convenient way to store and distribute configuration information. In such a case, your tool should save all user settings in the session document; your tool must not require external files to reestablish a previously configured connection. Whenever your tool does require an external file to operate properly, it should check for the existence of that file and notify the user if the file is not present.

To prevent resource ID conflicts, your tool should use resource IDs that are out of the range of IDs that Apple's system resources use. Even when taking this precaution, font IDs may conflict. The only sure way to avoid this is to register your font IDs with Developer Technical Support. This problem arises because your tool's resource map gets linked into the resource chain, while your tool's code is executing, just below the system file's resource map.

Keeping your tool task-specific

The Communications Toolbox supports three kinds of communications tools: connection, terminal, and file transfer. Your tool should be one of these types and must not implement any services that another type of tool is intended to provide. For instance, if you are writing a terminal tool, it must not provide any connection services. Observing this principle helps ensure that tools will not interact with each other in unintended ways. Each type of tool is meant to provide specific services:

- Connection tools control the data path and its specifications. They can also alter the data path or strip high bits, as needed.
- Terminal tools control user input and output, including input from the mouse or keyboard, and output to the terminal emulation window.
- File-transfer tools control sending and receiving disk files, or other encapsulated data entities. Only file-transfer tools should manipulate disk files or the file system.

Tools written for the Communications Toolbox are meant to be used in a way that enables users to change one part of a communications configuration and still have the application work for them. For instance, a user running a VT100™ terminal emulation over a modem connection should be able to run the emulation over an X.25 connection and not notice any changes.

However, if a terminal or file-transfer tool requires a specific type of connection (because of the protocol or standard being implemented) that is not in place, your tool should send an error to the application. A tool must never cause a system-level error when a user tries to use it in the "wrong" configuration. Rather, it should detect the presence or absence of a tool and send appropriate return codes to the application.

When writing a tool to implement an existing communications standard, you might find that the functions included in the standard require more than one type of tool for implementation. In cases like this, try to keep your tool task-specific by making use of the Macintosh interface. For example, if a connection protocol requires that your tool have status information constantly available, your tool can display this information in a separate window. You can also implement the standard by writing two task-specific tools that must be used together.

User interface considerations

This section describes the user interface considerations you should keep in mind when designing your tool. These considerations include

- modeless tool operation
- the standard tool-settings dialog box
- windows and status dialog boxes
- error alerts
- menus
- handling errors
- using the right words

Modeless tool operation

Your tool should be modeless because the Communications Toolbox (and most applications that use it) allows for multiple simultaneous communications sessions; your session may not be the only one running (and your tool may be in use in more than one session at a time). Also keep in mind that even if the user is running a single session, he or she may be running that session under MultiFinder.

Although specific applications can present other user interfaces, the user will usually configure a tool from within an application by using the standard tool-settings dialog box, open or close the connection with menu items, and send or receive files with menu items. This dialog box and the menus are the basic aspects of the user interface.

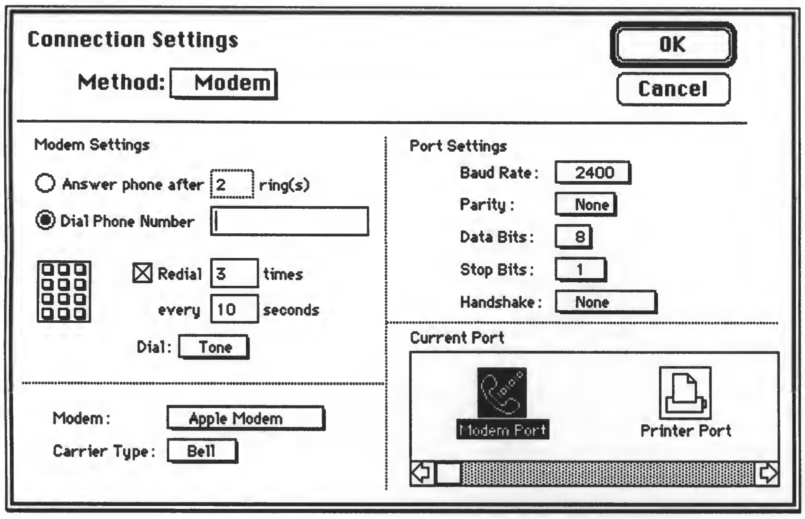
The user will usually create a new document, configure it by using the standard tool-settings dialog box, and save it. Your tool should save all user settings in the session file, typically in a separate resource for each of the communications tool types (connection, terminal, and file transfer). The design of the Communications Toolbox assumes that the application will save settings in session documents so that a user can use a preconfigured document to open a connection. A user who uses several setting combinations is expected to prepare and use a separate document for each combination.

Users should not need to perform more configuration tasks when they open a connection or transfer a file; the only dialog boxes that should appear at this time are status dialog boxes. Therefore, your tool should fill in appropriate default settings when it is first selected in the standard tool-settings dialog box.

The standard tool-settings dialog box

Since users can use different tools inside the same application, the standard tool-settings dialog box for each tool ought to be visually compatible with those of other tools. This compatibility allows users to apply what they learn about configuring one type of tool to configuring a second type of tool. *Figure A-1* shows a sample tool-settings dialog box for a connection tool.

■ **Figure A-1** A sample tool-settings dialog box for a connection tool


Connection Settings

Method: Modem

Modem Settings

○ Answer phone after 2 ring(s)

● Dial Phone Number

☒ Redial 3 times every 10 seconds

Dial: Tone

Modem: Apple Modem

Carrier Type: Bell

Port Settings

Baud Rate: 2400

Parity: None

Data Bits: 8

Stop Bits: 1

Handshake: None

Current Port: Modem Port

Many communications tools require more parameters set by the user than can be displayed attractively in a modal dialog box the size of the Macintosh Plus screen. Consider having your tool use 9-point Geneva for tool controls, instead of 12-point Chicago.

If your tool is complex and requires more controls than can fit in a modal dialog box even when using 9-point Geneva, it can divide these controls among two or more dialog boxes. The controls should be grouped according to function. Your tool should place the controls a user is most likely to select in the first dialog box displayed when the standard tool-settings dialog box comes up; it should place "power user" controls in subsequent dialog boxes.

Since the standard tool-settings dialog box is modal, your tool should not use additional modal dialog boxes that pop up on top of the standard tool-settings dialog box. If your tool requires a cascading dialog box, it should use dialog boxes like `SFGetFile`, which controls settings that do not usually need to be changed. Your tool should never display more than two layers of modal dialog boxes on the screen at the same time.

Windows and status dialog boxes

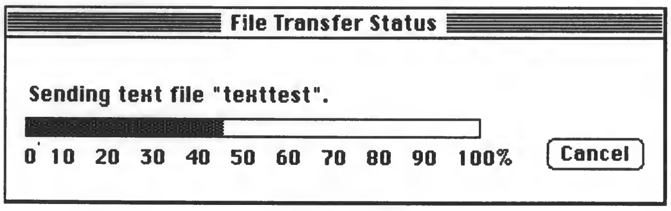
The terminal window is the only window that any of the communications tools displays during normal operation. But a connection or file-transfer tool might need to pass information to the user. Since these tools should not place text in the terminal window, such a tool should display its own window or modeless dialog box.

Display of status dialog boxes is the most common method tools use to request input or display output. When a tool performs an operation that will take a long time—for example, transferring a file or establishing a complex connection—the tool should post a status dialog box. This status dialog box should have the following characteristics:

- It should be modeless.
- It should contain a Cancel button to allow the user to stop the operation. Use of the Command-period key combination for cancellation is problematic because multiple sessions may be running; users could inadvertantly cancel dialog boxes other than the one they intended to cancel, by pressing the Command-period key combination several times.

Figure A-2 shows an example of a file-transfer tool status dialog box.

- **Figure A-2** Example file-transfer tool status dialog box


File Transfer Status

Sending text file "texttest".

A tool might also put up its own window for user input and output during a session. For example, a connection tool might provide a command window that allows users to type in commands directly to control the connection. Your tool should either display this kind of window when the application initially selects your tool, or install a custom menu item that toggles in a manner similar to Hide Clipboard/Show Clipboard. Keep in mind that all command functions should be available through standard Macintosh controls, such as menu items and configuration dialog box settings. If your tool displays a command-line mode for compatibility with an existing standard, the command-line mode should supplement the standard Macintosh interface rather than replacing it.

Error alerts

Your tool is responsible for informing users of significant error conditions if the `cmQuiet` or `ftQuiet` bit is not set in the connection record or file transfer record. For instance, a connection tool should provide the user with status information when opening or closing a connection, and a file transfer tool should report the success or failure of a file transfer. However, a tool should not report less critical information, for example, showing a message when reading or writing data.

Menus

Your tool can place a menu of its own in the menu bar of the application. However, it should avoid displaying such menus, because the menu bar has limited available space, and application designers tend to assume that they can use the entire menu bar. Also, since up to three tools can be active at once, up to three tool menus might be displayed in addition to the menus owned by the application. If you do choose to implement a menu for your tool, choose a menu name that is as short as possible to avoid overflowing the menu bar.

Tool-specific menus are placed to the right of application menus. This means that if the menu items of your tool have Command-key equivalents, they will override any conflicting Command-key equivalents for application menus. If two tool menus are displayed at the same time, the rightmost menu will override the other in a similar fashion. Also, your application should not have any Command-key equivalents for non-ADB (Apple Desktop Bus™) keyboards; conflicts can arise out of the need to use the Control key as a Command key.

Handling errors

Your tool should allow users to set up any communications configuration, even ones that are unuseable. This allows a system administrator to configure and save a session document for another person, who uses a different configuration from that on the system administrator's machine. In such cases, your tool should return an error only if the user attempts to open a connection, start terminal emulation, or initiate a file transfer using a setup that won't work.

Using the right words

Macintosh developers normally use terms that are intuitive and easy to learn, even for naïve users. However, this practice sometimes conflicts with the need to use established industry-standard terms, which may be difficult for the novice to understand. Since communications software developers often implement preexisting industry standards, this problem is especially common for developers of communications tools.

Where standard terms for a function already exist and are widely accepted in the industry, you can use the standard terms. This convention is meant to ensure both that your tool properly implements the standard, and that experienced communications users who are familiar with the standard terms are not confused. However, you should attempt to make these terms as easily understandable as possible for inexperienced users. You can do this in several ways. Alternate standard terms are sometimes available. For example, the term *Show Controls* and its less-intuitive counterpart *Transparent Mode* are used by Digital Equipment Corporation for the same VT102™ terminal setting. You might also be able to embed the standard term in a longer description, or use small graphics in the tool-settings dialog box to make meanings clearer.

Compatibility requirements

The Communications Toolbox can run on all Macintosh computers that have:

- at least 1 MB of RAM
- Macintosh Plus (128K) ROM, or later versions
- system software version 6.0.4, or a later version

In order to be compatible with future releases of system software, it is important that your tool be 32-bit clean. Your tool may have additional requirements or restrictions.

Keyboard considerations

Terminal tools should support all Macintosh keyboards, including the classic Macintosh keyboard with and without the detatchable keypad. If arrow keys, function keys, the Control key, or other keys are required by your tool but are not on all keyboards, your tool should provide an alternative means of accessing them. Your tool could provide a keypad menu, or allow the user to use the Command key as a Control key.

Appendix B **Useful Code Samples**

THIS APPENDIX shows you solutions to common programming problems:

- implementing effective idle loops
- determining events that need to be handled by one of the Communications Toolbox managers
- customizing the tool-settings dialog box
- determining whether the Communications Toolbox managers are installed

Using `FTExec` and `TMIdle` effectively

The following code sample shows when your application needs to call `FTExec` and `TMIdle` during a file transfer.

```
PROCEDURE DoIdle;
VAR
      theWindow     : WindowPtr;            { The target to idle }
      doFT          : BOOLEAN;              { route data to FT Tool }
      doTM          : BOOLEAN;              { route data to Term Tool }
      savedPort     : GrafPtr;              { for later reset }

BEGIN
      GetPort(savedPort);                   { Save for later }
      theWindow := FrontWindow;             { Gimme the first one }

      { Give idle time for the window }
      WHILE (theWindow <> NIL) DO BEGIN
            (*
            Make sure the window belongs to the application
            *)

            SetPort(theWindow);             { Focus on it }

            IF gConn <> NIL THEN            { Give time to the connection }
                  CMIdle(gConn);

            doFT := FALSE;                  { Send data to FT tool }
            doTM := TRUE;                   { Send data to terminal tool }

            IF gFT <> NIL THEN BEGIN
                  { Is there a file transfer in progress ?? }
                  IF BAND(gFT^^.flags, ftIsFTMode) <> 0 THEN BEGIN
                        doFT := TRUE;
                        gWasFT := TRUE;

                        { If the FT tool uses my connection then }
                        { don't route data to the terminal tool }

                        IF BAND(gFT^^.attributes, ftSameCircuit) <> 0 THEN
                              doTM := FALSE;
                  END   { In progress }

                  ELSE BEGIN
                        IF gWasFT THEN BEGIN
                              { FT no longer in progress }
                              gWasFT := FALSE;

                              { if it failed, alert }
                              IF BAND(gFT^^.flags, FTSucc) = 0 THEN
                                    ; { Handle error }

                              (*
                                Re-add the file transfer auto-receive string
                                that was removed at FTStart()
                                *)

                            END;

                            { AutoReceive string was received? }
                            IF gStartFT THEN
                                DoReceive;

                        END; { No FT in progress }

                        IF doFT THEN                        { Give time to FT tool }
                            FTExec(gFT);

                    END; { Good FT Handle }

                    IF gTerm <> NIL THEN BEGIN
                        { Send data to terminal }
                        IF doTM THEN BEGIN
                            TMIdle(gTerm);      { So it can blink its cursor, etc }

                            TermRecvProc;               { Send Data to the terminal }
                        END; { Send data to terminal }

                    END; { Good Terminal }

                    { Try the next window }
                    theWindow := WindowPtr(WindowPeek(theWindow)^.nextWindow);

                END; { while each window }

                SetPort(savedPort);                     { Back to the way it was }

            END; { DoIdle }

            PROCEDURE TermRecvProc;
            VAR
                theErr      : CMErr;                    { Any errors }
                status      : CMStatFlags;              { For the conn tool }
                sizes       : BufferSizes;
                flags       : INTEGER;

            BEGIN
                IF (gConn <> NIL) AND (gTerm <> NIL) THEN BEGIN

                    { Get the state of the connection      }
                    theErr := CMStatus(gConn, sizes, status);

                    IF (theErr = noErr) THEN  BEGIN

                        { Route the data if we have any }
                IF (BAND(status, cmStatusDataAvail) <> 0) AND
                   (sizes[cmDataIn] <> 0) THEN BEGIN

                    { Don't overflow my buffer }
                    IF sizes[cmDataIn] > kBufferSize THEN
                        sizes[cmDataIn] := kBufferSize;

                    { Tell the tool to get the data  }
                    theErr := CMRead(gConn, gBuffer, sizes[cmDataIn],
                                     cmData, FALSE,NIL,0,flags);

                    { Send data to the terminal }
                    IF (theErr = noErr) THEN
                        sizes[cmDataIn] := TMStream(gTerm,gBuffer,
                                                  sizes[cmDataIn],flags);

                END; { sizes <> 0 }

            END; { Good Status }

            IF (theErr <> noErr) THEN
                AlertUser('Couldn''t send data to terminal',FALSE);

        END; { Good term & conn }

END; { TermRecvProc }
```

Determining events for Communications Toolbox managers

The following routines show how an application can determine if an event needs to be handled by one of the Communications Toolbox Manager event-processing routines.

```
FUNCTION     IsFTWindow(theWindow: WindowPtr): BOOLEAN;
VAR
        pWindow:     WindowPtr;
        tempFT:      FTHandle;
        hFT:         FTHandle;

BEGIN
        IsFTWindow := FALSE;

        IF WindowPeek(theWindow)^.windowKind <> dialogKind THEN
                Exit(IsFTWindow);

        tempFT := FTHandle(GetWRefCon(theWindow));

        pWindow := FrontWindow;

        WHILE pWindow <> NIL DO
                BEGIN
                hFT := GethFT(pWindow);
                IF hFT <> NIL THEN
                        BEGIN
                        IF LONGINT(hFT) = LONGINT(tempFT) THEN
                                BEGIN
                                IsFTWindow := TRUE;
                                Exit(IsFTWindow);
                                END;
                        END;
                pWindow := WindowPtr(WindowPeek(pWindow)^.nextWindow);
                END;
END;

FUNCTION IsFTEvent(theEvent: EventRecord): FTHandle;
VAR
        theWindow     : WindowPtr;
        hFT           : FTHandle;

BEGIN
        IsFTEvent := NIL;
        theWindow := NIL;

        CASE theEvent.what OF
                autoKey, keyDown:   { no Command-key equivalents on a Macintosh Plus }
                        BEGIN
                        theWindow := FrontWindow;
                        END;
                mouseDown:
```

```
                BEGIN
                IF  FindWindow(theEvent.where,  theWindow)=0  THEN
                        ;
                END;
        updateEvt:
                BEGIN
                theWindow  :=  WindowPtr(theEvent.message);
                END;
        activateEvt:
                BEGIN
                theWindow  :=  WindowPtr(theEvent.message);
                END;
        END;  {case}

    IF  theWindow  <>  NIL  THEN
        BEGIN
        IF  IsFTWindow(theWindow)  THEN
                BEGIN
                hFT  :=  FTHandle(GetWRefCon(theWindow));
                IsFTEvent  :=  hFT;
                END
        ELSE
                BEGIN
                hFT  :=  GethFT(theWindow);
                IF  hFT  <>  NIL  THEN
                        BEGIN
                        IF  BAND(hFT^^.flags,  FTIsFTMode)  <>  0  THEN
                                IF  BAND(hFT^^.attributes,
                                          FTSameCircuit)  <>  0  THEN
                                        IF  theEvent.what  IN
                                            [autoKey,  keyDown]  THEN
                                                IsFTEvent  :=  hFT;
                        END;
                END;
        END;
END;

{$S  EventSeg}
FUNCTION  IsConnEvent(theEvent:  EventRecord):  ConnHandle;
VAR
    theWindow     :  WindowPtr;
    hConn         :  ConnHandle;

BEGIN
    IsConnEvent  :=  NIL;
    theWindow  :=  NIL;

    CASE  theEvent.what  OF
        autoKey,  keyDown:    {  no  Command-key  equivalents  on  a  Macintosh  Plus  }
                BEGIN
                theWindow  :=  FrontWindow;
```

```
                    END;
                mouseDown:
                    BEGIN
                    IF  FindWindow(theEvent.where,  theWindow)=0  THEN
                        ;
                    END;
                updateEvt:
                    BEGIN
                    theWindow  :=  WindowPtr(theEvent.message);
                    END;
                activateEvt:
                    BEGIN
                    theWindow  :=  WindowPtr(theEvent.message);
                    END;
                END;  {case}

        IF theWindow  <>  NIL  THEN
                BEGIN
                IF  IsConnWindow(theWindow)  THEN
                    BEGIN
                    hConn  :=  ConnHandle(GetWRefCon(theWindow));
                    IsConnEvent  :=  hConn;
                    END;
                END;
END;

{$S  EventSeg}
FUNCTION  IsTermEvent(theEvent:  EventRecord):  TermHandle;
VAR
        theWindow     :  WindowPtr;
        hTerm         :  TermHandle;

BEGIN
        IsTermEvent  :=  NIL;
        theWindow  :=  NIL;

        CASE  theEvent.what  OF
                autoKey,  keyDown:   {  no  command-key  equivalents  on  a  Mac  plus  }
                    BEGIN
                    theWindow  :=  FrontWindow;
                    END;
                mouseDown:
                    BEGIN
                    IF  FindWindow(theEvent.where,  theWindow)=0  THEN
                        ;
                    END;
                updateEvt:
                    BEGIN
                    theWindow  :=  WindowPtr(theEvent.message);
                    END;
                activateEvt:
                    BEGIN
                    theWindow  :=  WindowPtr(theEvent.message);
                    END;
            END;  {case}

      IF  theWindow  <>  NIL  THEN
            BEGIN
            IF  IsTermWindow(theWindow)  THEN
                  BEGIN
                  hTerm  :=  TermHandle(GetWRefCon(theWindow));
                  IsTermEvent  :=  hTerm;
                  END;
            END;
END;


PROCEDURE  MainLoop;
VAR
      theEvent       :  EventRecord;
      theWindow      :  WindowPtr;
      theWindowPeek  :  WindowPeek;
      theControl     :  ControlHandle;
      savedPort      :  GrafPtr;
      theKey         :  CHAR;

      processed      :  BOOLEAN;
      result         :  LONGINT;
      hFT            :  FTHandle;


BEGIN
      WHILE  NOT  done  DO
            BEGIN
            SystemTask;

            DoIdle;                    {  application  idle  loop  procedure  }
            IF  WaitNextEvent(everyEvent,theEvent,  0,  NIL)  THEN
                  BEGIN
                  hFT  :=  IsFTEvent(theEvent);
                  IF  hFT  <>  NIL  THEN
                        FTEvent(hFT,  theEvent)
                  ELSE
                        BEGIN
                        CASE  theEvent.what  OF
                              autoKey,  keyDown:
                                    DoKey(theEvent);
                              mouseDown:
                                    DoClick(theEvent);
                              updateEvt:
                                    DoUpdate(theEvent);
                              app4Evt:
                                    DoResume(theEvent);
                              activateEvt:
```

```
                                        DoActivate(theEvent);
                                   END; { case }
                              END;
                         END; { gne }
                    END; { if done }
          END;
```

The custom tool-settings dialog box

The sample code that follows shows how your application can use Connection Manager routines to present the user with a custom tool-settings dialog box.

`Choose.P`

This performs the standard dialog box for configuration and selection of a Connection tool.

```
CONST
       ChooseItemOK       =      1;           { Location of Dialog Box Items }
       ChooseItemCancel   =      2;
       ChooseItemPopup    =      5;
       ChooseResourceBase =      256;

TYPE
       dialogInfoP        =      ^dialogInfo; { storage private to the config dialog box}
       dialogInfo         =      RECORD
              tempProcID  :      INTEGER;     { MUST be the first item in record }
              magicCookie :      LONGINT;     { MUST be the second item in the record }

              tempConfig  :      Ptr;         { config record being used -
                                                these are needed by the filter proc }
              count       :      INTEGER;
       END;

FUNCTION     ChooseEntry(VAR theHandle: ConnHandle; where: Point): INTEGER;
{ theHandle is the current connection handle.
  where is the upper-left corner of the selection dialog box. }


VAR
       maxExtent  :  Rect;          { max size of dialog box in global oordinates
       oldSize :     Point;         { old size of dialog box before resizing }

       savedPort  :  GrafPtr;       { saved port }
       theWindow  :  WindowPtr;     { for invalidating after DisposDialog }
       theDialog  :  DialogPtr;     { the choose dialog box}
       infoP :       dialogInfoP;   { pointer to dialog data }

       tempTool  :   Str255;        { currently selected tool name }
       oldName  :    Str255;        { initially selected tool name }

       theControl  : ControlHandle;{ Pop-up Control  }
       hMenu  :      MenuHandle;    { handle to popup menu control's menu }
       theItem  :    INTEGER;       { for manipulating dialog box items }
```

```
        itemKind :    INTEGER;
        itemHandle : Handle;
        itemRect :    Rect;

        thePtr :      Ptr;          { ptr to temporary configuration record }
        configSize : LONGINT;       { Size of the congiguration record }

        oldVal :      INTEGER;      { old pop-up menu value }
        newVal :      INTEGER;      { current pop-up menu value }

        hDITL :       Handle;       { handle to DITL to append }

        theErr :      OSErr;        { for building list of tools }
Label
        1;                          { Cleanup }

BEGIN
        ChooseEntry := ChooseFailed;                { pessimistic }
        InitCursor;                                 { reset to arrow }
        GetPort(savedPort);

        theDialog := nil;
        infoP := nil;

        theDialog := GetNewDialog(chooseResourceBase, NIL, POINTER(-1));
        IF theDialog = NIL THEN                     { unsuccesful }
              Goto 1;                               { Go Cleanup }

        SetPort(theDialog);
        infoP := dialogInfoP(NewPtr(SIZEOF(dialogInfo))); { internal data space }
        IF infoP = NIL THEN                         { no memory }
              Goto 1;                               { Go Cleanup }
        SetWRefCon(theDialog, LONGINT(infoP));      { set the refcon to infoP

        WITH infoP^ DO
        BEGIN
              count := CountDITL(theDialog);        { # items in DITL }

              tempProcID := theHandle^^.procID;     { get the tool procID }
              CMGetToolName(tempProcID, tempTool);  { get the toolname }
              oldName := tempTool;                  { save the toolname }

              thePtr := theHandle^^.config;         { get the config field }
              configSize := GetPtrSize(thePtr);     { get size of config record }
        IF MemError <> noErr THEN                { memory problem }
            Goto 1;                              { Go Cleanup }

        tempConfig := NewPtr(configSize);        { copy it if possible... }
        IF tempConfig = NIL THEN                 { didn't get it }
            Goto 1;                              { Go Cleanup }

        BlockMove(thePtr, tempConfig, configSize); { copy it }

        { set up pop-up menu }
        theControl := GetNewControl(chooseResourceBase, theDialog);
        IF theControl = NIL THEN
            Goto 1;                              { Go Cleanup }

        hMenu := GetMHandle(chooseResourceBase);
        IF hMenu = NIL THEN
            Goto 1;                              { Go Cleanup }

    { Enter all of the connection tools into the pop-up menu }
        theItem := 1;
        theErr := noErr;
        WHILE theErr = noErr DO                  { while no problems }
        BEGIN
            theErr := CRMGetIndToolName( ClassCM, theItem, tempTool);

            IF theErr = noErr THEN               { no problems ociffer }
            BEGIN
                IF tempTool <> '' THEN           { got one! }
                BEGIN
                    { Orig. tool? Case INsens, Diacrit sens }
                    IF EqualString(tempTool, oldName, FALSE, TRUE) THEN
                        oldVal := theItem;


                    AppendMenu(hMenu, 'X');
                    { this is to prevent problems with special
                    menu characters, like /}
                    SetItem(hMenu, theItem, tempTool);
                    { get the next one please }
                    theItem := theItem + 1;
                END;
            END;
        END; {while}

        theItem := theItem - 1;                  { One too many above }

        IF oldVal = 0 THEN                       { Current tool not in menu }
```

```
BEGIN
      { The user has moved the file out of the communications
        directory - we can show the name, but this menu item
        needs to be disabled }
      theItem := theItem + 1;          { Update these counts }
      oldVal := 1;
      InsMenuItem(hMenu, 'X', 0);
      SetItem(hMenu,oldVal,oldName);
      DisableItem(hMenu, oldVal);      { disable it }
END;

SetCtlMax(theControl, theItem);        { max of ctl = num tools}

{ fix rectangle size in case of control resize }
GetDItem(theDialog, ChooseItemPopup, itemKind, itemHandle, itemRect);
itemRect := theControl^^.contrlRect;
SetDItem(theDialog, ChooseItemPopup, itemKind, itemHandle, itemRect);

oldSize := theDialog^.portRect.botRight;{ old size of dialog box}

newVal := oldVal;
SetCtlValue(theControl, oldVal);       { set up pop-up value }

                                       { get DITL to append }
hDITL := CMSetupPreflight(tempProcID, magicCookie);

{
  Set the dialog's text info based on
  the tool's finf resource
}

AppendDITL(theDialog, hDITL, appendDITLBottom); { append it }
IF hDITL <> NIL THEN                   { done with the DITL }
      DisposHandle(hDITL);

                                       { set up the items }
CMSetupSetup(tempProcID, tempConfig, count+1, theDialog, magicCookie);

MoveWindow(theDialog, where.h, where.v, TRUE);  { move dialog box }
ShowWindow(theDialog);

                                          {Get dialog box size}
maxExtent := WindowPeek(theDialog)^.strucRgn^^.rgnBBox;

theItem := 0;
WHILE (theItem <> ChooseItemOK) AND (theItem <> ChooseItemCancel) DO
BEGIN
      ModalDialog(@ChooseFilter, theItem);  { modal dialog box}
      IF theItem = ChooseItemPopup THEN     { did pop-up get hit? }
      BEGIN
                                       { what is new value? }
            newVal := GetCtlValue(theControl);
```

```
IF newVal <> oldVal THEN
{ it has changed! }
BEGIN
      { cleanup the setup  }
      CMSetupCleanup(tempProcID, tempConfig, count+1,
                     theDialog, magicCookie);
      ShortenDITL(theDialog,
                  CountDITL(theDialog) - count);
      { done with tool }
      CMSetupPostflight(tempProcID);
      { reset size }
      SizeWindow(theDialog, oldSize.h,
                 oldSize.v, TRUE);

      { get new tool name }
      GetItem(hMenu, newVal, tempTool);
      { get procID }
      tempProcID := CMGetProcID(tempTool);

      hDITL := CMSetupPreflight(tempProcID,
                                magicCookie);
      { new DITL }

   {
          Set the dialog box's text info based on
          the tool's finf resource
   }

      { append it }
     AppendDITL(theDialog, hDITL, appendDITLBottom);
    IF hDITL <> NIL THEN
            { get rid of it }
            DisposHandle(hDITL);

      { get rid of old config }
      DisposPtr(tempConfig);
      tempConfig := NIL; { pessimistic }
      { and get a new one }
      CMDefault(tempConfig, tempProcID, TRUE);
      if tempConfig = NIL then
      BEGIN              { Clean up from error}
            ShortenDITL(theDialog,
                        CountDITL(theDialog) - count);
            CMSetupPostflight(tempProcID);
            { Out of memory }
            chooseEntry := chooseFailed;
            Goto 1;      { Finish cleanup }
      END;

      CMSetupSetup(tempProcID, tempConfig, count+1,
                  { set up the items }
                  theDialog, magicCookie);
```

```
                    oldVal := newVal;   { Now the old tool }
                    UnionRect(maxExtent,
                    WindowPeek(theDialog)^.strucRgn^^.rgnBBox,
                    maxExtent);         {grow max size}
                END;
            END; {item = count }

            IF theItem > count THEN         { tool's item hit }
                CMSetupItem(tempProcID, tempConfig, count+1, theDialog,
                        theItem, magicCookie);
        END;                        {while theItem NOT OK or Cancel}

        HideWindow(theDialog);              { hide the dialog box }
        newVal := GetCtlValue(theControl);  { check name change}
        GetItem(hMenu, newVal, tempTool);   { get the new name }
        tempProcID := CMGetProcID(tempTool);

        { Clean out the old tool }
        CMSetupCleanup(tempProcID, tempConfig, count+1, theDialog, magicCookie);
        ShortenDITL(theDialog, CountDITL(theDialog) - count);
        CMSetupPostflight(tempProcID);

        IF theItem = ChooseItemOK THEN
        BEGIN                       { has the name of tool changed? }
            IF NOT EqualString(oldName, tempTool, FALSE, TRUE) THEN
            BEGIN
                ChooseEntry := ChooseOKMajor;
                tempProcID := CMGetProcID(tempTool);

                IF NOT DoNewConn(ConnHandle(theHandle), tempProcID,
                            tempConfig) THEN
                    ChooseEntry := ChooseAborted;

                IF theHandle = NIL THEN    { disaster! }
                    ChooseEntry := ChooseDisaster
                ELSE
                BEGIN
                    configSize := GetPtrSize(tempConfig);
                    BlockMove(tempConfig,
                            theHandle^^.config, configSize);
                    { validate for kicks }
                    IF CMValidate(theHandle) THEN
                    END;
            END
            ELSE
            BEGIN                           { same tool, so validate }
                ChooseEntry := ChooseOKMinor;
                configSize := GetPtrSize(tempConfig);
                BlockMove(tempConfig, theHandle^^.config, configSize);
                IF CMValidate(theHandle) THEN
                    ;
                    END;
                END
                ELSE                                        { user hit CANCEL }
                    ChooseEntry := ChooseCancel;

{ now we need to go through window list and update all areas that were ever
covered up by the config dialog box which has grown and potentially shrunk.
We have kept track of the largest size of the dialog box.  we will now convert
it to local coords and invalrect everybody in the window list }
                theWindow := FrontWindow;
                WHILE theWindow <> NIL DO
                BEGIN
                    SetPort(theWindow);
                    itemRect := maxExtent;
                    { get max extent in local coords }
                    GlobalToLocal(itemRect.topLeft);
                    GlobalToLocal(itemRect.botRight);
                    InvalRect(itemRect);

                    theWindow := WindowPtr( WindowPeek(theWindow)^.nextWindow );
                END;

        END;    { with }
1: { Clean everything up }
        IF theDialog <> nil THEN DisposDialog(theDialog);
        IF infoP <> nil THEN
        BEGIN
            IF infoP^.tempConfig <> nil THEN DisposPtr(infoP^.tempConfig);
            DisposPtr(Ptr(infoP));
        END;
        SetPort(savedPort);                         { back to original port }
END;

{ change from one connection type to another }
FUNCTION DoNewConn(VAR hConn:ConnHandle; tempProcID:INTEGER;
                    tempConfig:Ptr): BOOLEAN;
VAR
        savedDesiredSizes   :       BufferSizes;
        savedRefCon         :       LONGINT;
        savedUserData       :       LONGINT;
        savedFlags          :       LONGINT;
        savedReserved0      :       LONGINT;
        savedReserved1      :       LONGINT;
        savedReserved2      :       LONGINT;

        status              :       LONGINT;
        sizes               :       BufferSizes;
        theErr              :       CMErr;

BEGIN
        theErr := CMStatus(hConn, sizes, status);   { get conn status }
        IF theErr = noErr THEN                      { OK }
```

```
          IF  BAnd(status,  CMStatusOpen+CMStatusOpening)  <>  0  THEN
                    ;
{The  connection  is  open  -  confirm  if  the  user  really  wants  to  close  the  connection  -
setting  result  to  FALSE  if  user  aborts}

      WITH  hConn^^  DO                          {  save  all  desired  parameters  }
      BEGIN
            savedFlags  :=  flags;
            savedDesiredSizes  :=  BufSizes;
            savedRefCon  :=  refcon;
            savedUserData  :=  userData;
            savedReserved0  :=  reserved0;
            savedReserved1  :=  reserved1;
            savedReserved2  :=  reserved2;
      END;

      CMDispose(hConn);                          {  get  rid  of  old  conn  }

      hConn  :=  CMNew(tempProcID,  savedFlags,  savedDesiredSizes,  savedRefCon,
                        savedUserData);
      IF  hConn  <>  NIL  THEN
            WITH  hConn^^  DO  BEGIN              {  Restore  other  fields  }
                  reserved0  :=  savedReserved0;
                  reserved1  :=  savedReserved1;
                  reserved2  :=  savedReserved2;
            END;
      DoNewConn  :=  TRUE;
END;

{  Choose  dialog  box  filter  procedure  }
FUNCTION  ChooseFilter(theDialog  :  DialogPtr;  VAR  theEvent:EventRecord;
                        VAR  theItem:INTEGER)  :  BOOLEAN;
VAR
      theControl    :      ControlHandle;
      where         :      Point;
      result        :      BOOLEAN;
      theKey        :      CHAR;

      savedPort     :      GrafPtr;
      theWindow     :      WindowPtr;            {  for  event  processing  }

      pDialogInfo   :      DialogInfoP;          {  dialog  box  private  data  }

BEGIN
      theItem  :=  0;                            {  nothing  initially  }
      result  :=  FALSE;                         {  for  now…  }

      pDialogInfo  :=  DialogInfoP(GetWRefCon(theDialog));    {  get  the  dlog  data  }
      WITH  pDialogInfo^  DO
      BEGIN
            result  :=  CMSetupFilter(tempProcID,  tempConfig,  count+1,  theDialog,
                                    theEvent,  theItem,  magicCookie);
```

```
        ChooseFilter  :=  result;               { TRUE or FALSE }
        IF result THEN                          { it WAS processed }
            Exit(ChooseFilter);                 { so exit }
    END;

    CASE theEvent.what OF                       { process the event }
        updateEvt:
        BEGIN
            GetPort(savedPort);                 { get the port }
            theWindow  :=  WindowPtr(theEvent.message);
                                                { get the update owner }
            SetPort(theWindow);
            BeginUpdate(theWindow);
            EraseRect(theWindow^.portRect);     { erase }

            IF theWindow = theDialog THEN       { process if ours }
                UpdtDialog(theDialog, theWindow^.visRgn);

            EndUpdate(theWindow);               { otherwise eat it }
            SetPort(savedPort);
            result := TRUE;                     { We regenerate updates when
                                                  we have finished choosing }
        END;
        mouseDown:
        BEGIN
            where := theEvent.where;            { where was the mouse-down }
            GlobalToLocal(where);               { convert to local coords }

            IF FindControl(where, theDialog, theControl) <> 0 THEN
                                                {Click in control?}
            BEGIN
                IF TrackControl(theControl,
                                    where, POINTER(-1)) <> 0 THEN
                                                { track it }
                BEGIN
                    result := TRUE;             { we got the event }
                    theItem := FindDItem(theDialog, where) + 1;
                                                { so item hit }
                END
                ELSE BEGIN                      { tracked out of it }
                    result := TRUE;
                    theItem := 0;               { so no item hit }
                END;
            END;
        END;
        keyDown:                                { keyDown }
        BEGIN
            {Standard return/enter/cmd '.' processing }
        END;
        otherwise
        BEGIN
```

```
                END;
        END; { case }
        ChooseFilter := result;
END;
```

Choose.r

```
#define ChooseResourceBase   256

resource 'DLOG' (ChooseResourceBase, "setup dialog") {
        {0, 0, 70, 450}, dBoxProc, invisible, noGoAway, 0x0, ChooseResourceBase,
        "Setup Dialog Box"
};
resource 'CNTL' (ChooseResourceBase, "Tools control ") {
        {30, 5, 50, 300},
        popupRightJust,      /* right just */
        visible,
        90,                  /* width of title */
        ChooseResourceBase,  /* menu associated */
        popupMenuCDEFproc,   /* no options CDEF 63 = 16 * 63 + variation code */
        0,                   /* reference menu 11000, pop-up title width 50 */
        "Method:"            /* Title */
};
resource 'DITL' (ChooseResourceBase, "Basic configuration DITL") {
        {    /* array DITLarray: 5 elements */
                {32, 370, 52, 440},
                Button {
                        enabled, "OK"        /* [1] */
                },
                {5, 370, 25, 440},           /* [2] */
                Button {
                        enabled, "Cancel"
                },
                {28, 366, 56, 444},          /* [3] outline of OK button */
                UserItem {
                        enabled
                },
                {5, 5, 21, 200},             /* [4] title */
                StaticText {
                        disabled, "Connection Configuration"
                },
                {30, 5, 50, 300},            /* [5] select tool popup menu user item */
                UserItem {
                        enabled
                }
        }
};
resource 'MENU' (ChooseResourceBase, "Popup Menu") {
        ChooseResourceBase, textMenuProc, allEnabled, enabled, "Choose Menu",
        { /* Items are added to this menu at execution time */
        }
};
```

Determining whether the managers are installed

This sample code shows how your application can determine whether the Communications Toolbox managers are installed.

```
FUNCTION Installed : BOOLEAN;
CONST
       CommToolboxTrap = $8B;
       UnimplementedTrapNumber = $9F;

BEGIN
       Installed := TRUE;
       IF NGetTrapAddress(UnimplementedTrapNumber, OSTrap) =
            NGetTrapAddress(CommToolboxTrap, OSTrap) THEN
       BEGIN
              Installed := FALSE;
       END;
END;
```

Glossary

background procedure: A procedure that runs while the user is using another application.

cache region: The area in the terminal emulation window in which information is displayed that has scrolled out of the terminal emulation region.

channel: A logical line of communication that exists on a connection.

Communications Resource Manager: The Communications Toolbox manager that makes it easier for your application to register and keep track of communications resources.

communications resource record: A Communications Resource Manager data structure that contains information such as the type of device the record represents, and whether or not the device is available for use.

Communications Toolbox utilities: A Communications Toolbox manager that contains useful routines, most of which are not specific to programming networking or communications applications.

completion routine: Any application-defined code to be executed when an asynchronous call to a routine is completed.

connection: A logical line of communication between two entities.

Connection Manager: The Communications Toolbox manager that makes it easier for you to implement and maintain data connections.

connection record: A Connection Manager data structure containing information that describes one instance of a connection tool.

connection tool: A self-contained collection of resources that implements a specific connection protocol.

control definition procedure: A procedure called by the Control Manager when it needs to implement the functions of a specific type of control.

entity: A task or process running on a computer. Two entities can coexist on the same computer if the computer is multitasking, like when applications are running in a MultiFinder environment.

File Transfer Manager: The Communications Toolbox manager that makes it easier for you to implement file transfers.

file-transfer record: A File Transfer Manager data structure that contains all the specifics about a file transfer. For example, the file-transfer record might show that the File Transfer Manager should use the XMODEM tool to perform file transfers, and that the tool should not display any custom menus while transferring files.

file-transfer tool: A self-contained collection of resources that implements a specific file-transfer protocol.

filter procedure: A routine that `ModalDialog`, `NuLookup`, and `NuPLookup` call to filter or modify events that occur in a dialog box.

Macintosh Toolbox: The software in the Macintosh ROM that helps you implement the standard Macintosh user interface in your application.

Name Binding Protocol (NBP): The AppleTalk transport-level protocol that translates a character string name into the internet address of the corresponding socket client. NBP enables AppleTalk protocols to understand user-defined zones and device names by providing and maintaining translation tables that map these names to corresponding socket addresses.

routine: A function or procedure.

terminal emulation: The process of making a computer emulate the characteristics of a terminal.

terminal emulation buffer: The area in memory that contains the data displayed in the terminal emulation region.

terminal emulation region: The area in the terminal emulation window in which your application writes the output of its terminal emulation. This region is the same size (number of rows and columns, or pixels) as the screen of the terminal your application is emulating.

terminal emulation window: The window in which your application displays a terminal emulation region and cache region.

terminal environment record: A Terminal Manager data structure that reflects the internal conditions of a terminal tool.

Terminal Manager: The Communications Toolbox Manager that makes it easier for you to implement terminal emulation.

terminal record: A Terminal Manager data structure that contains the specifics of a terminal emulation. For example, the terminal record might show that your application is emulating a VT320 terminal, and that the Terminal Manager should try to cache the terminal window before clearing it.

terminal tool: A self-contained collection of resources that implements the characteristics of a specific terminal.

zone: An arbitrary subset of the networks within an internet.

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